71-30

An Announcement of Recent Acquisitions. . .

HSL No. 71-30 December 3, 1971 HS-010 169 - HS-010 232, HS-800 510 - 512,517 - 522, HS-800 525,527 - 528, HS-800 530,53
555 - 558, HS-810 166 - 168,172, HS-820 104 - 105,105

transpo 72

U.S. International Transportation Exposition
Dulles International Airport
Washington, D.C.
May 27-June 4, 1972

HSL No. 71-30
December 3, 1971

THIS ISSUE CONTAINS:

U.S. Department of Transportation / National Highway Traffic Safety Administration

Research Institute, Office of Accident Investigation and Data Analysis
Washington, D.C. 20590

INTRODUCTION

Publications announced in *Highway Safety Literature* include the most recent additions to the collection of the NHTSA Scientific & Technical Information Service. Subject areas covered include all phases of highway, motor vehicle, and traffic safety, especially those encompassed by the National Traffic and Motor Vehicle Safety Act of 1966 and the Highway Safety Act of 1966.

Individual issues of *HSL* are numbered according to the year and the issue number within that year; thus, 71 designates the year and 1, 2, 3, etc. the individual issues. To aid the user in locating citations by the HS-number, the cover bears the inclusive entry number for each issue.

Entries in *HSL* are arranged according to the NHTSA Subject Category List shown in the Table of Contents. The list is a two-level arrangement consisting of five major subject fields subdivided into 59 subject groups. Documents related directly to the National Highway Traffic Safety Administration (NHTSA) are announced in a separate section headed NHTSA DOCUMENTS and are numbered in five distinct series: NHTSA Accident Investigation Reports (HS-600 000 series). NHTSA Compliance Test Reports (HS-610 000 series), NHTSA Contractors Reports (HS-800 000 series), NHTSA Staff Speeches, Papers, etc. (HS-810 000 series), and NHTSA Imprints (HS-820 000 series). For NHTSA DOCUMENTS in series HS-600 000 and HS-610 000, individual full case reports are available for inspection at the National Highway Traffic Safety Administration. HS-800 000 series and HS-800 000 series are available for purchase from NTIS or GPO (see page ii). Although announced together in a separate section, these documents are also assigned specific subject categories for machine retrieval.

A document which contains a number of separate articles is announced as a complete volume in the subject category most applicable to it as a whole. Entries for the individual articles appear in their most specific subject category.

SAMPLE ENTRIES

Subject Category Array

NHSB Accession no..... HS-800 218 Fld. 5/21; 5/9

Title of document..... AN INVESTIGATION OF USED CAR SAFETY STANDARDS–SAFETY INDEX: FINAL REPORT. VOL. 6 - APPENDICES G-L

Personal author(s)..... by E. N. Wells; J. P. Fitzmaurice; C. E. Guilliams; S. R. Kalin; P. D. Williams

Corporate author..... Operations Research, Inc.

Collation

Publication date..... 1969 150p
Contract FH-11-6921
Report no. ORI-TR-553-Vol-6; PB-190 523

Abstract..... Appendices G-L to this study of used car safety standards include: indenture model diagrams for classes I-IV motor trucks; degradation, wear, and failure data for motor truck classes I-IV; and safety index tables for classes I-IV motor trucks.

Search terms; Wear; Trucks; Failures; Used cars; Inspection' standards

AVAILABILITY: NTIS

HS-004 497 Fld. 5/19

AUTO THEFT–THE PROBLEM AND THE CHALLENGE

by Thomas A. Williams, Sr.

Journal citation . . . Published in *FBI Law Enforcement Bulletin* v37 n12 p15-7 (Dec 1968)

Gives figures on the extent of the auto theft problem and comments on antitheft devices available now or in the planning stage.

Search terms: Theft; Theft protection; Stolen cars

TABLE OF CONTENTS

NOTE: ( ) Numbers in parentheses following certain subject groups indicate the Highway Safety Program Standards (No. 1, and up) and/or Federal Motc. Vehicle Safety Standards (No. 101 and up) which may apply to these groups.

NHTSA SUBJECT FIELDS AND GROUPS

NOTE: Material published in Highway Safety Literature (HSL) is intended for the information and assistance of the motor vehicle and highway safety community. While brand names, equipment model names and identification, and companies may be mentioned from time to time, this data is included as an information service. Inclusion of this information in the HSL should not, under any circumstances, be construed as an endorsement or an approval of any particular product, course, or equipment by the U. S. Department of Transportation, National Highway Traffic Safety Administration.

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AND
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Department of Transportation personnel may borrow copies of publications directly from the NHTSA. Outside the Washington, D.C. area, phone (202) 426-2768. In Washington, D.C. area, use government ID, phone 118-62768. Non-DOT personnel should contact their company or agency libraries for assistance.

Journals cited may be obtained through most research libraries.

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HRB: Highway Research Board, National Academy of Sciences, 2101 Constitution Ave., N. W., Washington, D. C. 20418.

NHTSA: National Highway Traffic Safety Administration General Services Division, Washington, D.C. 20591 (Telephone (202) 426-0874),

SAE: Society of Automotive Engineers, Dept. HSL, 2 Pennsylvania Plaza, New York, N.Y. 10001. Order by SAE report numbers. Prices given are list; discounts are available to members and sometimes to libraries and U. S. Government Agencies. Prepayment is required; orders without payment are subject to a $1 handling charge.

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WHEN REQUESTING a document, to be absolutely sure you receive what you order, give the accession number (HS, PB, AD number) or report number (in cases such as an SAE document), title of report, and the personal or corporate author (whichever is cited). When requesting an HS-numbered document from NTIS (CFSTI), add DOT/to the prefix HS-; example HS-800 000 should be ordered as DOT/HS-800 000.

1/0 ACCIDENTS

1/3 Investigation

HS-010 169 Fld. 1/3

AN EVALUATION OF NINE REPORTS DISTRIBUTED BY THE NORTH CAROLINA DEPARTMENT OF MOTOR VEHICLES

by Philip B. McGill

Research Triangle Inst.

1969 27p
Report no. RM-ON-413-1

In an attempt to evaluate the timeliness and utility of a number of accident reports generated by the North Carolina traffic records system and distributed to law enforcement authorities, driver education representatives, and interested organizations and associations, questionnaires were sent to the majority of the names on the various mailing lists. A follow-up procedure, on a sample basis, provided additional information on the usefulness of the reports. It was concluded that current regular reports are too academic and late to be of optimum value. A majority of those who receive them, however, wanted to continue getting them.

Search terms: Questionnaires; Accident reports; North Carolina

HS-010 170 Fld. 1/3

HIGHWAY ACCIDENT REPORT. MULTIPLE-VEHICLE COLLISIONS UNDER FOG CONDITIONS, FOLLOWED BY FIRES, NEW JERSEY TURNPIKE, NORTH OF GATE 2, NOVEMBER 29, 1969

National Transp. Safety Board

1971 95p
Report no. NTSB-HAR-71-3; SS-H-6

On November 29, 1969, in a southbound lane of the New Jersey Turnpike, at about 7:45 a.m., a 1969 Mercury sedan entered sudden dense fog, at about 45 miles per hour. The driver slowed to 30, but was overrun by a tractor and a tank-semitrailer, loaded with 9,257 gallons of propane. The tank-semitrailer overturned, blocking both southbound lanes and the shoulder. In rapid succession 10 vehicles entered the area with multiple collisions between them and the trailer. Fire started near one of the passenger vehicles. Then, a loaded tractor semi-trailer struck several vehicles and the overturned tank-semitrailer, causing a crack in the shell of the propane trailer. Fire spread rapidly and destroyed nine vehicles. There were 6 fatalities, 3 serious, and 15 less serious injuries. The probable cause of this multiple vehicle accident was the penetration by vehicles in an area of dense fog (visibility 20 to 50 feet), together with the varying rates of speed which prevented appropriate evasive action and a lack of fog warning signs. In all, 29 vehicles were involved.

Search terms: Multiple vehicle accidents; Fog; Reduced visibility caused accidents; Secondary collisions; Truck overturn accicents; Accident caused fires; Accident analysis; Weather caused accidents; Fog warning systems; Warning signs; Tractor semitrailers; Tank trucks; Hazardous materials; Fatalities; Vehicle vehicle collisions; Vehicle explosions; Fuel tank rupture; Fuel tank leakage

AVAILABILITY: NTIS $3.00

HS-010 171 Fld. 1/3; 4/7

A VEHICLE INTERACTION MODEL: A METHOD FOR DETERMINING EXPOSURE TO SEVERAL TYPES OF ACCIDENT SITUATIONS

by Donald D. van der Zwaag

Published in *HIT LAB Reports* p3-6 (Jun 1971)

A model for determining exposure to specific types of accident situations, rather than to all accident situations, is explained. This analysis was primarily concerned with turnpike accidents. It is concluded that if one calculates the density of vehicles on the roadway and makes certain basic assumptions concerning the behavior of traffic flow, one can determine the exposure for two vehicles moving in the same direction on a turnpike. This exposure is found by calculating the rate of overtaking. Hopefully, this exposure information will provide a better approximation of relative accident rates for several types of vehicles than is presently obtainable through conventional methods (such as those based on vehicle miles).

Search terms: Mathematical models; Accident risks; Overtaking; Toll roads; Accident rates; Speed patterns; Traffic models; Traffic flow

HS-010 172 Fld. 1/3; 1/4

THE GO-TEAM CONCEPT OF ACCIDENT INVESTIGATION

by Paul H. Wright

Georgia Inst. of Tech.

Published in HS-010 177, *1970 Conference on Railroad-Highway Grade Crossing Safety Proceedings*, Chicago, p54-64

4 refs

Presented at 1970 Conference on Railroad-Highway Grade Crossing Safety, Atlanta, 25-27 Aug 1970.

Recently, emphasis has been placed on in-depth accident investigations by multidisciplinary teams. At universities and research centers around the country, 30 such teams should be in operation by 1972. The Atlanta team uses a medical-engineering approach with a neurological surgeon, pathologist, psychologist, civil engineer, mechanical engineer, social worker, automotive technician,

1/3 Investigation (Cont'd.)

HS-010 172 (Cont'd.)

team is concerned with accident initiating factors, post-impact kinematics of vehicle occupants, and accident traumas and agents causing injuries. Selected collisions are investigated on the scene and intensive studies are made of the location, vehicles, and people involved. A summary report of a grade crossing accident is appended.

Search terms: Accident causes; Accident investigation; Railroad grade crossing accidents; Vehicle train collisions; Safety programs; Accident location; Multidisciplinary teams; Federal role; Accident reports

1/4 Locations

HS-010 173 Fld. 1/4

THE NATIONAL SAFETY COUNCIL'S CONCERN FOR GRADE CROSSING SAFETY

by Howard Pyle

National Safety Council

Published in HS-010 177, *1970 Conference on Railroad-Highway Grade Crossing Safety Proceedings*, Chicago, p5-7

Presented at 1970 Conference on Railroad-Highway Grade Crossing Safety, Atlanta, 25-27 Aug 1970.

The Council's Committee on Railroad-Highway Traffic Safety was established in 1915; 1,000 persons a year were killed in grade crossing accidents then. Uniform protective devices and laws were recommended by the Council, but rail-highway fatalities reached an annual average of 1,850 in the period 1928-32. Public education and other efforts reduced the accident rates in more recent years. However, the fatality-to-injury rate is high for grade crossings, and studies show most grade crossing roads should not have to bear the full burden of improving grade crossings. Relatively small investments of public funds may produce quicker results in safety than in almost any other way.

Search terms: Accident statistics; Railroad grade crossings; Railroad grade crossing accidents; Safety campaigns; Financing; Accident location

HS-010 174 Fld. 1/4

THE DIAGNOSTIC TEAM APPROACH TO THE EVALUATION OF RAIL-HIGHWAY GRADE CROSSINGS

by Hoy A. Richards

Texas A. and M Univ., Texas Transp. Inst.

Published in HS-010 177, *1970 Conference on Railroad-Highway Grade Crossing Safety Proceedings*, Chicago, p17-32

Presented at 1970 Conference on Railroad-Highway Grade Crossing Safety, Atlanta, 25-27 Aug 1970.

The Texas Highway Department, in cooperation with the Bureau of Public Roads, used the diagnostic team approach for grade crossing safety evaluation. The team is interdisciplinary with members representing all groups responsible for safe rail-highway grade crossing operation. Crossings were selected and studied, using physical characteristics, accident records, and aerial photographs. The teams identify unsafe crossings, recommend on-the-spot and longer term improvements and measures to reduce accident potentials, and develop lines of communication between the responsible operating groups and individuals.

Search terms: Accident prevention; Accident causes; Vehicle train collisions; Safety programs; Railroad grade crossings; Multidisciplinary teams; Accident location; Topographical factors; Warning systems; State

HS-010 175 Fld. 1/4; 1/3

RAILROADS AND THE GRADE CROSSING PROBLEM

by R. C. Grayson

Saint Louis-San Francisco Railway Co.

Published in HS-010 177, *1970 Conference on Railroad-Highway Grade Crossing Safety Proceedings*, Chicago, p1-4

Presented at 1970 Conference on Railroad-Highway Grade Crossing Safety, Atlanta, 25-27 Aug 1970.

Grade crossing accidents account for two-thirds of all accident fatalities involving railroads. Though some states have relieved the rail carriers of major financial responsibility for crossing protection, more should be done by means of a national approach to unify local and state efforts and set uniform standards. Of about 225,000 railroad-highway intersections in the United States, 44,000 are protected by automatic warning devices. As newer roads carry more traffic, older grade crossings can be eliminated.

Search terms: Railroad grade crossing accidents; Railroad grade crossings; Railroad grade crossing signals; Financing; Federal role; Accident location

HS-010 176 Fld. 1/4; 1/5

KEYNOTE ADDRESS. [1970 NATIONAL CONFERENCE ON RAILROAD–HIGHWAY GRADE CROSSING SAFETY]

by Alfred E. Johnson

American Assoc. of State Hwy. Officials

Published in HS-010 177, *1970 Conference on Railroad-Highway Grade Crossing Safety Proceedings*, Chicago,

Presented at 1970 Conference on Railroad-Highway Grade Crossing Safety, Atlanta, 25-27 Aug 1970.

High speed rail demonstration projects and continuing interest in highway safety have renewed Washington's interest in the grade crossing problem. Federal appropriations began as early as 1933 and by 1969 about 11,900 grade crossings were eliminated or reconstructed as grade separations, and 12,700 were protected. In 1969, there were 3,774 grade crossing accidents, producing 1,490 deaths and 3,369 injuries. Over the ten-year period since 1960, the number of grade crossing accidents, deaths, and injuries have remained remarkably static, in spite of a 43% increase in motor vehicle registration and in miles traveled on the highways. During this period, there have been 0.4 deaths and one injury per grade crossing accident. Percentages are given on the character of vehicle-train collisions, the types of vehicles involved, and protected grade crossings. To separate or protect all railroad grade crossings would be extremely expensive. How financing could be arranged is still being discussed.

Search terms: Accident location; Accident prevention; Accident statistics; Railroad grade crossing accidents; Vehicle train collisions; Federal role; Railroad grade crossings; Community support; History; Warning systems; Financing; Accident rates; Injury rates; Fatality rates

HS-010 177 Fld. 1/4; 2/4; 1/3; 4/2

1970 NATIONAL CONFERENCE ON RAILROAD–HIGHWAY GRADE CROSSING SAFETY, AUGUST 25-27, 1970, ATLANTA, GEORGIA. PROCEEDINGS

by George Lemke, ed.

National Safety Council; Highway Res. Board

Includes HS-010 172; HS-010 173; HS-010 174; HS-010 175; HS-010 176; HS-010 178; HS-010 179; HS-010 180; HS-010 181 and HS-010 182.

The conference objective was to provide and develop assistance, informational, and program guidelines to reduce railroad-highway grade crossing crashes and enhance understanding and respect between the private and public sectors involved. Representatives of local, state and federal government, railroads, motor vehicle operators, suppliers, and research agencies were present. Basic problems discussed included administrative and financial responsibilities, data on crossings, and program definitions.

Search terms: Accident prevention; Accident investigation; Railroad grade crossing accidents; Vehicle train collisions; Safety programs; Railroad grade crossings; Multidisciplinary teams; Railroad grade crossing signals; Railroad grade crossing signs; Community support; Accident location; Financing; Federal role

HS-010 178 Fld. 1/4; 4/1

EXEMPT CROSSINGS AND MANDATORY STOPS PANEL

by Neil Darmstadter; A. Burnham; Robert J. Forman; John D. Gilfillan; William L. Oliver; C. Austin Sutherland

Published in HS-010 177, *1970 Conference on Railroad-Highway Grade Crossing Safety Proceedings,* Chicago, p38-53

Presented at 1970 Conference on Railroad-Highway Grade Crossing Safety, Atlanta, 25-27 Aug 1970.

Representatives of the Georgia State Highway Dept., Greyhound Lines, Rock Island and Pacific Railroad, California Public Utilities Commission, and National Tank Truck Carriers discussed the pros and cons of mandatory stops at and warn highway traffic before proceeding). The main problems discussed are: collisions occurring because vehicles were stopping for a grade crossing; types of vehicles, such as tank trucks, school buses, and vehicles carrying explosives, being required to stop when others are not; criteria for exempting grade crossings; reluctance of railroads to remove abandoned crossings; and differing regulations covering railroad-highway grade crossings in the various states.

Search terms: Accident location; Accident prevention; Railroad grade crossing accidents; Safety programs; Railroad grade crossings; California; Georgia; Traffic laws

HS-010 179 Fld. 1/4; 4/2

GRADE CROSSING ACCIDENTS: SOLUTION BY COORDINATED COMMUNITY INVOLVEMENT

by Lloyd E. Sellers

California Dept. of Hwy. Patrol

Published in HS-010 177, *1970 Conference on Railroad-Highway Grade Crossing Safety Proceedings,* Chicago, p33-7

Presented at 1970 Conference on Railroad-Highway Grade Crossing Safety, Atlanta, 25-27 Aug 1970.

San Joaquin County has about 1,000 grade crossings. During the first quarter of 1970, 13 train-auto accidents killed 15 persons, causing about half of all traffic fatalities. Most accidents were at signalized crossings with good visibility. The state police developed an accident reduction program through the traditional enforcement, education, and engineering. Court penalties were raised for signal light violations, railroads asked to report crossing violations or near misses, and police increased their enforcement at crossings. Public education campaigns used radio and TV announcements, in-

1/4 Locations (Cont'd.)

HS-010 179 (Cont'd.)

to traffic engineers and railroads for action.

Search terms: Accident prevention; Railroad grade crossing accidents; Vehicle train collisions; Safety programs; State action; Warning systems; Traffic law enforcement

HS-010 180 Fld. 1/4; 4/2

FINANCING OF IMPROVEMENTS AT RAIL-HIGHWAY GRADE CROSSINGS PANEL

by Douglas M. Fergusson; T. B. Hutcheson; Donald P. Ryan; Harry Stern

Published in HS-010 177, *1970 Conference on Railroad-Highway Grade Crossing Safety Proceedings*, Chicago, p65-76

Presented at 1970 Conference on Railroad-Highway Grade Crossing Safety, Atlanta, 25-27 Aug 1970.

There are about 225,000 grade crossings in the United States. Protective devices cost from $11,000 for a single track flashing light to $35,000 or more for a multi-track gated crossing. Devices have been financed by railroads, state and local governments, and with cost participation by state and Federal governments. Federal assistance funds could be made available from the highway trust funds. The TOPICS program of the 1968 Highway Act made funds available for railroad crossing improvements. That may total one billion dollars over the next 15 years. The Illinois Grade Crossing Protection Fund provides $100,000 a month from motor fuel taxes. As a result, grade crossing fatalities were 10.5 percent lower in 1965-69 than in the 1951-55 period.

Illinois; Financing; State action; Warning systems; Traffic Operations Program to Increase Capacity and Safety

HS-010 181 Fld. 1/4; 4/4

PANEL ON FEDERAL GOVERNMENT ACTIVITY IN RAIL-HIGHWAY GRADE CROSSING SAFETY

by Charles W. Prisk; Curtis L. Shufflebarger; William J. Hedley; Walt W. Osborne; Henry S. Libby; William E. Loftus; Martin M. Puncke

Department of Transp.

Published in HS-010 177, *1970 Conference on Railroad-Highway Grade Crossing Safety Proceedings*, Chicago, p77-93

Presented at 1970 Conference on Railroad-Highway Grade Crossing Safety, Atlanta, 25-27 Aug 1970.

The Federal grade crossing safety program is as old as Federal highway aid to states – 54 years. Three years ago, the Joint Action Group was formed from the Federal Highway and Railroad Administrations. This group helped to inventory grade crossings, form diagnostic teams, work on safety for the high speed demonstration project, and coordinate accident investigation and research. Grade crossing deaths have declined each year since 1966. Equitable assignment of public and private responsibilities for grade crossing protection concerns the federal government. Federal Railroad Administration is the only federal agency that issues statistics on grade crossing accidents, and more detailed coordinated information is needed.

Search terms: Accident prevention;

HS-010 182 Fld. 1/4; 4/4

CRITIQUE OF THE FIVE-YEAR PROGRAM FOR RAIL-HIGHWAY GRADE CROSSING IMPROVEMENT: [A PANEL]

by Otto F. Sonefeld; David M. Schoppert; Robert C. Hunter

Federal Railroad Administration; Voorhees (Alan M.) and Associates, Inc., Federal Hwy. Administration

Published in HS-010 177, *1970 Conference on Railroad-Highway Grade Crossing Safety Proceedings*, Chicago, p94-109

Presented at 1970 Conference on Railroad-Highway Grade Crossing Safety, Atlanta, 25-27 Aug 1970.

The Department of Transportation rail-highway grade crossing program began in 1967. Use of matrix diagrams gives a perspective on the problem by relating grade crossing statistics to classes of highways, streets, and railroads. Benefits of improvement were related to costs to develop a five year program of study, research and development, and planning for improvements. Analysis shows the need for lower cost devices and that most locations are not on roads eligible for federal funding.

Search terms: Accident prevention; Safety programs; Railroad grade crossings; Benefit cost analysis; Matrix reduction; Warning systems; Federal role; Accident location

1/5 Statistical Data

HS-010 183 Fld. 1/5

ARIZONA'S TRAFFIC ACCIDENT SUMMARY FOR 1970

Arizona Hwy. Dept.

accidents; accident location; citations; registration and involvement; vehicles in accidents; accidents; drivers in accidents; road information; school bus information; driver reported accidents; economic loss 1970; and national facts 1970.

Search terms: Arizona; Accident statistics; Accident location; Fatality rates; Injury rates; Accident types; Accident reports; Traffic law violations; Age factor in accidents; Sex factors in accidents; Pedestrian fatalities; Light conditions caused accidents; Pedestrian injuries; Weather caused accidents; Month; School bus accidents; Accident costs; Vehicle registration; Accident rates; Time of accidents; Day of week; Accident causes; Driver age; Driver occupation; Driver physical fitness; Road condition caused accidents

HS-010 184 Fld. 1/5; 1/2

SEQUELAE OF ROAD INJURIES. A REVIEW OF ONE YEAR'S ADMISSIONS TO AN ACCIDENT HOSPITAL

by W. Gissane; J. Bull; Barbara Roberts

Published in *Injury* v1 n3 p195-203 (Jan 1970)

3 refs

In 1961, 4,342 road accident cases were admitted to the Birmingham Accident Hospital, 1,268 as in-patients. About half of these were short-stay cases, and about one quarter severe cases requiring intensive care. Of the in-patients, about one quarter were pedestrians, and half were motorcyclists and car occupants. Average treatment time was 11.5 days. Head injuries and limb fractures were common among all types of road users. Permanent disablement was found in 21% of all surviving in-patients, and was particularly common among motorcyclists and pedestrians. Of the severe injuries, more than half occurred after office hours, and more injuries occurred hospital alive and the frequency of injuries resulting in permanent disablement indicate the need for research by major accident departments that could uncover the causes and nature of such injuries, and so lead to improved methods of their prevention.

Search terms: Injury statistics; Injuries; Injury research; Injury causes; Injury costs; Fatalities; Injury rates; Injury severity; Accident hospitals; Pedestrian injuries; Motorcycle operator injuries; Motorcycle passenger injuries; Bicycle rider injuries; Fractures; Internal injuries; Collisions; Driver injuries; Passenger injuries

HS-010 185 Fld. 1/5; 1/3

HOW TO BRING *MORE* BACK ALIVE!

Automobile Club of Michigan

1967 61p

The Automobile Club of Michigan made an on-the-spot survey of traffic deaths that occurred in the summer of 1966. The most important findings were: (1) drinking was involved in 44% of the 363 fatal accidents; (2) the point system is not keeping the problem driver off the road; (3) nearly 70% of all fatal accidents occurred on two-lane roads; (4) young drivers (16 to 18 years old) were responsible for a disproportionately large number of these fatal accidents; (5) 89% of the fatalities involved some law violations–indicating that many motorists don't have adequate knowledge of the law; (6) vehicle defect as an accident cause appeared to be practically nonexistent; (7) incompleteness of accident forms indicates a police manpower shortage and lack of training; (8) motorcycles and motorbikes were involved in a disproportionately large number of fatalities. The Automobile Club's position on each finding is given. Recom-

Search terms: Michigan; Accident statistics; Fatality rates; Problem drivers; Speed limits; Driver licensing; Police traffic services; High speed caused accidents; Motorcycle accidents; Day of week; Drinking drivers; Driver records; Accident records; Traffic law enforcement; Accident repeater drivers; Adolescent drivers; Driver intoxication; Accident location; Accident types; Accident causes; Traffic law violations; Time of day; Accident reports; Vehicle inspection; Point systems

HS-010 186 Fld. 1/5; 3/3

BICYCLE TRANSPORTATION: INFERENCES FROM MASS ACCIDENT DATA

by Haldon L. Smith

Published in *HIT LAB Reports* p7-18 (Jun 1971)

3 refs

A preliminary examination of bicycle accident data contained in automobile mass accident data files suggested a descriptive model of bicycle usage in Ann Arbor and Oakland County, Michigan. This model postulated substantial use of bicycles for commuting in Ann Arbor by university students and other bicyclists, as opposed to the principally recreational use of bicycles by young bicyclists. The analysis of this model demonstrates the inferences that can be drawn from obscure facts embedded in mass accident data and the problems that arise in determining relevant testing criteria.

Search terms: Bicycle accidents; Accident statistics; Vehicle bicycle collisions; Bicycle rider age; Chi square test; Day of week; Time of day; Month; Accident location; Accident rates; Injury severity; College students;

2/0 HIGHWAY SAFETY

HS-010 187 Fld. 2/0

DEFENSES IN THE BATTLE FOR ROAD SAFETY

Anonymous

Published in *Better Roads* v41 p7-12 (Jan 1971)

Much is now being done to make the roadway as safe as possible, yet there are still many unnecessary hazards within the traffic environment of driver, highway, and vehicles. Many highway engineering features may not of themselves prevent traffic crashes, but they can cushion the forces produced and thus save lives and reduce injuries. Again, the motorist, the road, and the vehicle, the three components of the traffic environment, must be efficiently coordinated if there is to be an improvement in the traffic safety scene.

Search terms: Highway engineering; Driver vehicle road interfaces; Injury prevention; Highway design; Safety design

2/9 Traffic Control

HS-010 188 Fld. 2/9

HEADWAY SENSING FOR AUTOMATICALLY CONTROLLED AND GUIDED VEHICLES

Johns Hopkins Univ.; Bendix Corp.

1970 218p 63 refs
Contract TRD-73
Report no. PB-198 452; APL/JHU-TCR-012

Final report for Apr-Jul 1970. Subcontracted to Bendix Aerospace Systems Div., subcontract–271989.

This report assesses the state-of-the-art in headway sensing and signal conditioning applicable to single mode automatically controlled guideway vehicles. The project conducted a survey of the available or potentially available methods of measuring short headways to an immediately preceding lead vehicle. The instrumentation is vehicle-mounted or guideway-mounted. The lead vehicle can use cooperative instrumentation. Measurement distances are 10 to 500 ft; vehicle speeds range from 10 to 60 mph; vehicle passenger capacity is 2 to 15 passengers; vehicle accelerations are less than 0.3 g; line capacities of interest are 6,000 to 45,000 people per hour. The survey stresses near term application of vehicle-borne microwave sensors, wayside presence detection and sensing nets to measure range, and range rate between vehicles. Data on other indirect sensing and profile control headway systems are also included.

Search terms: Automatic headway control; Automatic speed control; Cable guides; Microwave systems; Surveys; Guideway systems; Speed sensors; Sensors; Vehicle spacing; Radar; Guidance systems; State of the art studies; Electronic traffic control; Electronic devices in vehicles

AVAILABILITY: NTIS $3.00

HS-010 189 Fld. 2/9

THE 1970 EDITION OF THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES

by Robert E. Conner

Published in *Traffic Engineering* v41 n8 p5-13, 28-33 (May 1971)

The 1970 edition of the Manual on Uniform Traffic Control Devices has been approved and thus becomes the standard for traffic control devices for all streets and highways – regardless of their type or class or of the governmental agency having jurisdiction. This article highlights the revisions in the 1970 manual in regard to signs, pavement markings, warrants, signals, and traffic control.

Search terms: Manual on Uniform Traffic Control Devices for Streets and Highways; Traffic control device uniformity; Pavement markings; Traffic signal uniformity; Sign uniformity; Signal uniformity; Traffic control warrants

HS-010 190 Fld. 2/9; 4/7

FEASIBILITY AND EVALUATION STUDY OF RESERVED FREEWAY LANES FOR BUSES AND CAR POOLS. FINAL REPORT

by Donald G. Capelle; Frederick A. Wagner; David J. Hensing

Voorhees (Alan M.) and Associates, Inc.

31 Jan 1971 204p 11 refs
Contract FH-11-7454
Report no. PB-198 648; AMV-R-61-1114

Prepared in cooperation with Northwestern Univ. Traffic Inst. and Daniel Edelman, Inc.

A flow analysis of a Cleveland freeway, using a mathematical model and computer program, showed good potential for mixed bus and car pool reserved lanes. Feasibility depends on a number of lanes and automobile occupancy rates; with four lanes in one direction, use of a lane for buses and cars with at least three occupants was effective for all conditions studied. Two reserved lanes were found no better than one, and the lane next to the median was recommended. Problems of traffic operations, public information, user cost analysis, mode choice analysis, and law enforcement were examined for a full-scale demonstration.

Search terms: Travel time; Lane usage; Bus lanes; Car pools; Traffic law enforcement; Peak hour traffic; Traffic capacity; Traffic congestion; Traffic data analysis; Traffic density; Traffic flow; Traffic lanes; Freeways; Traffic simulation; Simulation models; Lane changing; Mathematical models; Public relations; Computerized simulation;

Cleveland; Feasibility studies; Benefit cost analysis; Modal choice

AVAILABILITY: NTIS $3.00

2/10 Traffic Courts

HS-010 191 Fld. 2/10; 2/11; 3/6

A STUDY OF THE NORTH CAROLINA TRAFFIC CASE REPORTING SYSTEM. FINAL REPORT

by Philip B. McGill

Research Triangle Inst.

1970 25p
Report no. FR-OU-500-2

A study was made to determine the probable volume of reportable traffic convictions which the courts of North Carolina do not report to the Department of Motor Vehicles. Highway patrol tickets, which contain final dispositions, were sampled, and the corresponding driver records were examined to see if those convictions were recorded. A companion sample was taken of court calendars to determine if the reporting rate for highway patrol tickets was significantly different from the reporting rate for local law enforcement tickets. The court calendar study showed that the reporting rates for local tickets and for highway patrol tickets were statistically the same, and hence valid conclusions concerning the combined reporting rate could be made from just the highway patrol rate. The sample of highway patrol tickets compared to the convictions recorded in the driver license file yielded a 93 percent reporting rate for reportable convictions. It is assumed that the majority of the remaining seven percent of the reportable convictions were not reported by the courts. Recommendations are made for improving the reporting rate.

Search terms: Convictions; Traffic courts; Traffic law enforcement; Traffic law violations; Driver records; Police traffic services; Traffic ticket systems; North Carolina

2/11 Traffic Records

HS-010 192 Fld. 2/11; 4/5

REVIEW OF TRAFFIC RECORDS SUBSYSTEMS OF OTHER STATES

by Barbara Moser

Research Triangle Inst.

1969 25p

A major objective of the current phase of the North Carolina traffic records systems study is the determination of beneficial system modifications. To obtain a clearer perspective of the available methods of solutions to traffic records systems problems, methods currently being employed by the states of Delaware, New Jersey, and Pennsylvania are reviewed in this report. Two tables, survey of state requirements for motor vehicles and maintenance of the stolen vehicle file, and survey of state requirements for motor vehicle operators, summarize this review. It is concluded that in every instance, the systems under review are performing quite similar tasks, but under slightly different organizations and with a variety of methods and concepts. It is obvious that the future trend of each system is toward total automation.

Search terms: Traffic records; Vehicle inspection; Vehicle registration; Driver license standards; Accident records; Automation; Computerized theft checks; Computerized driver records; Stolen vehicles; North Carolina; Delaware; New Jersey; Pennsylvania; Information systems; Data processing

HS-010 193 Fld. 2/11; 4/5

PRELIMINARY REPORT OF OBJECTIVES AND REQUIREMENTS FOR THE NORTH CAROLINA TRAFFIC RECORDS SYSTEM

by R. B. Williams; B. A. Moser

Research Triangle Inst.

1969 31p 3 refs

The first step in this report is to analyze and relate the traffic records to the statutes. In the second section of this paper, the overall missions and objectives of the traffic records system are stated. The third section states the objectives of each division within the system, and the last section relates the statutes to each division's functions and data forms. In conclusion, the comparison of statutes, functions, and records indicate that the objectives are being satisfied.

Search terms: Traffic records; North Carolina; Data processing; Information systems; State laws; Driver records; Driver licensing; Accident records; Vehicle registration; Vehicle inspection

HS-010 194 Fld. 2/11; 4/5

NORTH CAROLINA TRAFFIC RECORDS SYSTEM STUDY. PHASE 1. VOL. 1.

by R. B. Williams; P. N. Hunt; B. A. Moser; M. S. Russell; A. R. Schleicher; R. H. Thornton

Research Triangle Inst.

1968 220p

The framework of the existing traffic records system for the state of North Carolina is described. This description is an overview of the present system and constitutes the basis for a detailed analysis of the system user requirements to be made outside the scope of this effort. The analyses performed in this study are limited in detail but they form the basis for an evaluation of the requirements for future work. The forms and documents which are received, processed, and produced in the course of system operation have been collected and categorized. The functional operating procedures, in terms of the tasks to be accomplished, the number of vehicle records, drivers' records, and accident reports handled, the rate of processing, and the time involved are defined. The requirements for information flow and

2/11 Traffic Records (Cont'd.)

HS-010 194 (Cont'd.)

access have been analyzed. Information which is generated and the procedures involved in data production and processing are identified. Comparison with the federal safety standards is included.

Search terms: Traffic records; Driver education; Accident records; Data processing; Vehicle registration; Computerized driver records; Vehicle inspection; Computerized theft checks; Safety standards compliance; Information systems; North Carolina; Driver licensing

HS-010 195 Fld. 2/11; 4/5

FORMS AND REPORTS OF THE NORTH CAROLINA TRAFFIC RECORDS SYSTEM. FINAL REPORT. VOL. 2.

by R. B. Williams; B. A. Moser; M. S. Russell

Research Triangle Inst.

1968 319p

This report contains samples of all the forms and reports currently used in the North Carolina traffic records system with the exception of some in-house "worksheet" forms and reports which do not become involved in the overall information flow. Special forms which are used relatively seldom and some computer output reports are not included. Computer output reports of large volume and size have been described in detail in lieu of sample inclusion. All included documents have been categorized with respect to originating department or the department most involved in the processing procedures. The forms pertain to driver education, accident records, driver licensing, vehicle inspection and registration, financial security, state highway patrol, and state highway department activities.

Search terms: Accident records; Financial responsibility; Traffic ticket systems; Accident report forms; Vehicle registration forms; North Carolina; Police traffic services; Driver education; Vehicle inspection; Information systems; Driver licensing

HS-010 196 Fld. 2/11; 4/5

NORTH CAROLINA TRAFFIC RECORDS SYSTEM USER-NEED ANALYSIS, PHASE 2

by R. B. Williams; P. B. McGill; B. A. Moser

Research Triangle Inst.

1969 42p 2 refs

This report documents the survey and research efforts performed in completion of the user-need analysis of the North Carolina traffic record system. The methods of data collection for this analysis were observation of frequency of file utilization and interviews with personnel using the files daily. Tables summarize the users versus the estimate of file entries for an average week. It was determined that, for the most part, users of the files were within the agency maintaining the file. However, there is indication of intra-agency file usage, especially via the computer output terminals. Types of files include: driver license records; vehicle registration; stolen vehicles; accident records.

Search terms: Traffic records; Accident records; Data processing; Data acquisition; Driver records; Vehicle registration; Stolen vehicles; Information seeking; Information systems; Driver licensing; North Carolina

HS-010 197 Fld. 2/11; 4/5

NORTH CAROLINA TRAFFIC RECORDS SYSTEM STUDY. PHASE 3. FINAL REPORT

by P. Nileen Hunt; Barbara A. Moser; Robert H. Thornton

1971 384p
Report no. FR-OU-500

The objectives of this study were to describe, analyze, and, if necessary, recommend modifications and redesign of North Carolina's traffic records system. In Phase 1 the components of the traffic records system were identified and described. In Phase 2 the system was analyzed in terms of its ability to meet both present and future objectives and requirements. In this report the recommendations for system modification proposed in the Phase 2 final report are developed in detail. Types of records included are: traffic, accident, liability insurance, vehicle registration, vehicle inspection, driver licensing.

Search terms: Traffic records; Accident records; Data processing; Vehicle registration; Computerized driver records; North Carolina; Liability insurance; Vehicle inspection; Driver licensing; Information systems

3/0 HUMAN FACTORS

3/1 Alcohol

HS-010 198 Fld. 3/1; 4/1

WHAT OUR COURTS CAN DO ABOUT DRUNKS WHO DRIVE

by Douglas W. Toms

National Hwy. Traffic Safety Admin.

Published in *The Journal of Insurance* v32 n4 p9-15 (Jul-Aug 1971)

The Office of Alcohol Countermeasures was established within the National Highway Traffic Safety Administration for the specific purpose of combating the growing menace of drunken drivers. The emphasis is on the problem drinker who drinks heavily and sometimes reaches the level of chronic alcoholism, but the social drinker is not forgotten. The role of the courts is vital in this matter, but they cannot fight the problem single-handedly. Accelerated research is now underway to develop

driver and keep him from driving in this condition. One important it is public understanding of the ous relationship between abusive ig and driving.

ch terms: Alcohol education; hol usage deterrents; Alcohol ; Alcoholism; Social drinking; king drivers; Public opinion; Pro- drivers; Driver physiological test es; Driver intoxication; Courts

Driver Education

0 199 Fld. 3/5

REDUCTION. NEW DIMEN- FOR DRIVER EDUCA- ?

ert Benjamin Kelley

ied in *Traffic Safety* v71 n6 38 (Jun 1971)

ns differ on the value of high driver education programs. Be- of federal support, the program own considerably. Driving teachers couraged to teach the student bout vehicle design, environment, , and cultural elements that may ntributing to death, injury, and ty losses.

ch terms: High school driving ses; Driver education evaluation; uctors; Loss reduction; Accident ors

Driver Licensing

10 200 Fld. 3/6

RICAN ASSOCIATION OF OR VEHICLE ADMINISTRA- .S CONFERENCE ON VER LICENSING PRO- IS, ST. LOUIS, MISSOURI, CH 4-6, 1969. PROCEED-

American Assoc. of Motor Vehicle Administrators

1969 190p

Cover title: *1969 International Conference on Driver Licensing Problems.* Sponsored by Insurance Inst. for Highway Safety.

Subjects covered in relation to driver licensing include: the Uniform Vehicle Code; traffic courts; driver vision standards; driver tests; truck leasing; the importance of physicians in highway safety; classified driver licenses; motor carrier safety; control of problem drivers; truck drivers; driver education; driver physical fitness.

Search terms: Driver tests; Driver licensing; Problem drivers; Uniform Vehicle Code; Motor carriers; Driver license revocation; Driver license suspension; Classified driver licenses; Driver records; Traffic courts; Driver license cancellation; Driver vision standards; Driver license standards; Driver license laws; Driver physical fitness; Driver license renewal; Driver license examination; Driver education; Medical advisory boards; Truck drivers; Physicians and highway safety

4/0 OTHER SAFETY-RELATED AREAS

4/1 Codes and Laws

HS-010 201 Fld. 4/1

TRANSPORTATION OF HAZARDOUS MATERIALS

by William K. Byrd

Published in *Public Safety: A Growing Factor in Modern Design,* Washington, 1970 p29-35

Presented at a symposium held at fifth annual meeting, National Academy of Engineering, Washington, 1970.

In 1968 the chairman of the Hazardous Notice of Plan to Revise the Department of Transportation Hazardous Materials Regulations. One approach to the problem is the one the United Nations Committee of Experts on Transport of Dangerous Goods is working on. It is applicable to all modes of transports and may prescribe: general requirements for all packages (applicable to all classes except compressed gases and radioactive materials whether the package is new or is to be used more than once); supplemental general requirements for explosives; particular requirements for explosives; special requirements for each type of package (e.g., drums, boxes, bags); testing.

Search terms: Transportation of hazardous materials; Explosives; Packaging; Drop tests; Stacking tests; Hydraulic tests; Leakage tests; Transportation of explosives; Hazardous materials

4/2 Community Support

HS-010 202 Fld. 4/2

NINE GUIDES TO COMMUNITY ACTION

by Mel Powell

Published in *Traffic Safety* v71 n6 p12-13, 36-37 (Jun 1971)

The National Association of Counties Research Foundation has developed an action program and guidebooks for traffic safety at the local government level. The nine guidebooks cover responsibilities of local officials, legal authority, organization and administration, areawide approaches, planning, staffing, public support, financial and technical support, and action plans. The program resulted from extensive on-site examinations, interviews with state county, and municipal officials, and independent appraisals of safety program experiences.

Search terms: Community support; Local government; Highway safety programs; Legal factors; Highway

4/4 Governmental Aspects

HS-010 203 Fld. 4/4

DEPARTMENT OF TRANSPORTATION. FOURTH ANNUAL REPORT. FISCAL YEAR 1970

Department of Transp.

[1970] 187p
Report no. AR-4

The Department of Transportation is attempting to improve the safety of all forms of transportation. This report is divided into sections including: emphasis on safety; emphasis on environmental factors; civil rights; improvements in planning and coordination; international and facilitation programs; improvements in transportation facilities; research and vehicle development; urban systems planning; military activity and readiness; organizational and administrative developments; and challenges of the future.

Search terms: Transportation regulation; Urban transportation; Transportation planning; Transportation systems; Safety research; Dept. of Transportation; Annual reports; Vehicle safety; Highway safety; International factors; Environmental factors; Transportation departments; National defense

AVAILABILITY: GPO $0.75

4/6 Insurance

HS-010 204 Fld. 4/6

AUTOMOBILE ACCIDENT REPARATIONS–IS A NO-FAULT PLAN THE ANSWER?

by Jamed D. Ghiardi

Published in *Louisiana Bar Journal* p299-312 (16 Mar 1969)

This paper is an answer to criticism of the present auto insurance system. The assertions of the proponents of the no-fault plans concerning the delays in payment and trials, the insurance costs and benefit distribution, and the termination of fault are considered and rejected, and improvements in the present insurance system are suggested. An analysis of the Keeton-O'Connell, Saskatchewan, Puerto Rico, and American Insurance Association plans is made in the appendix.

Search terms: Insurance costs; Insurance rates; Insurance industry; No fault insurance plan; Liability insurance; Torts; Insurance claims; Fault; Accident compensation; Accident responsibility; Courts

4/7 Mathematical Sciences

HS-010 205 Fld. 4/7

OPERATIONS RESEARCH: IMPLICATIONS FOR SAFETY SYSTEMS MANAGEMENT

by Basil Y. Scott; Boris Tourin; Charlotte S. Hollenberg

Published in *Behavioral Research in Highway Safety* v1 n4 p227-34 (Winter 1970)

10 refs

Highway safety is a complex problem which calls for the use of systems analysis, rather than the "common sense" approach which has heretofore generally been applied to it. The federal standards for state highway safety programs can be met in many alternative ways. Operations research and systems analysis can help select the most beneficial ways in which compliance may be achieved by aiding in testing the relative effectiveness of various program elements and sub-elements. In this way, elements and sub-elements of the program which are based on invalid theories of accident causation can be eliminated from the program and more effective ones substituted. Also, previous unknown factors may be discovered and their influence determined. Driver license programs are discussed as an example.

Search terms: Decision making; Operations research; Systems analysis; Highway safety programs; Program evaluation review technique; Safety standards compliance; Driver license standards; Highway safety standards; Safety program effectiveness

5/0 VEHICLE SAFETY

5/1 Brake Systems

HS-010 206 Fld. 5/1

DISC BRAKE PAD WEAR EVALUATION

by M. W. Moore; B. Watton

Published in *Institution of Mechanical Engineers Proceedings 1970-71* v185 n12/71 p127-37

Prepared for presentation to Institution of Mechanical Engineers, London, 12 Jan 1971.

An instrument is described that provides an economical means by which normal motoring on public highways can be used to obtain reliable and relevant brake lining wear rate assessments, thus eliminating the need for the conventional artificial repetitive test. The development and final form of the instrument is detailed and its employment to monitor the brake usage, to provide a means of obviating abnormalities, and to detect changes in the wear rate of material is explained. Formulae are derived showing how the wear accumulated during any journey may be related to the mean brake temperature and the distance travelled, and graphs are used to demonstrate how the range of application of the instrument accommodates driver changes.

Search terms: Disc brakes; Brake pads; Brake tests; Brake lining wear; Brake lining tests; Wear tests; Brake temperature; Mathematical analysis

HS-010 207 Fld. 5/1; 4/7

ANALOG SIMULATION AS A DESIGN TOOL FOR ADVANCED BRAKING CONCEPTS

by G. B. Hickner; D. W. Howard

Bendix Automotive and Automation Co.

1970 8p 2 refs
Report no. SAE-700157

Presented at Automotive Engineering Congress, Detroit, Mich., 12-16 Jan 1970.

An analog computer simulation development for a passenger car foundation braking system is presented. A brake control system is added to the simulation. As the hardware for the brake control system is developed it is substituted into the simulation along with components of the foundation brake system. This mixture is a "physical simulation" where the analog simulation is reduced to represent only the vehicle and the road with appropriate interface elements for the actual brake and control system hardware. Included are studies conducted using physical simulation for tolerance study of vehicle characteristics as well as the foundation brake system and control system parameters. Results which validate the model are presented. The advantages of this approach which supports the development of an advanced brake control system are discussed.

Search terms: Brake system design; Computerized simulation; Analog computers; Brake systems; Brake controls; Simulation models; Validation; Laboratory tests; Road tests; Torque

AVAILABILITY: SAE

5/2 Buses, School Buses, and Multipurpose Passenger Vehicles

HS-010 208 Fld. 5/2; 3/4

STUDENTS ON A SCHOOL BUS HAS A DIRECT RELATIONSHIP TO THEIR SAFETY

by George Pope

Published in *School Bus Fleet* p31-5 (Jun-Jul 1971)

A school bus driver before he is put on the job should be properly trained, not only on how to drive the bus safely and care for it properly, but also on how to handle disciplinary problems. The school bus driver's basic responsibilities, in addition to those required by law, begin with his attitude toward and his relationship with his passengers. Different ways of handling discipline problems and the relationship that should exist between the driver, the parents, and the transportation office are considered. The case of the driver of handicapped children, and their special needs, is mentioned.

Search terms: School bus drivers; School bus passengers; School bus safety; Transportation of Handicapped; Driver attitudes; Driver behavior; Psychological factors; Driver motivation; Driver performance; Handicapped passengers

5/3 Cycles

HS-010 209 Fld. 5/3; 4/5

THE DEVELOPMENT OF A HIGH-PERFORMANCE MOTORCYCLE ENGINE

by G. P. Blair; M. B. Johnston

Published in *Institution of Mechanical Engineers Proceedings 1970-71* v185 n20/71 p273-83

11 refs

Prepared for presentation to Institution of Mechanical Engineers, London, 9 Feb 1971.

for motorcycles and leisure vehicles is increasingly important. This paper describes the effective utilization of a high speed digital computer for those calculations connected with the unsteady gas dynamics of flow in the exhaust and transfer systems, the stressing of the connecting rod, the balancing of the crankshaft, the design of the combustion chamber, and the analysis of the porting of other high-performance engines so that an information library is stored. A method of experimentally determining loop-scavenging efficiency is evaluated. Further, a unique method of asymmetrically timing the inlet process of a two-stroke cycle engine is described and its initial development reported. The design of a complete engine, of 250 cm^3 swept volume, is detailed and its road and test-bed performance characteristics appraised.

Search terms: Engine design; Engine performance; High powered engines; Two stroke cycle engines; Computerized design; Exhaust systems; Scavenging; Crankcases; Crankshafts; Motorcycles; Engine tests

5/4 Design

HS-010 210 Fld. 5/4

TEMPERATURE CONTROL

by F. W. Lauder

Published in *Automobile Engineer* v64 n5 p46-8, 51 (May 1971)

The two principal methods of controlling the automotive heater are the manual water valve and the thermostatic water valve. The advantages of the latter are described. These systems control heater discharge air. Automatic temperature control systems for the control of the interior temperature of the car are also described.

5/4 Design (Cont'd.)

HS-010 211 Fld. 5/4

VEHICLE FRONTAL IMPACT ANALYSIS

by Don Buckman; Don Borland

Published in *Search* v6 n1 4p (Jan-Feb 1971)

1 ref

General Motors has developed a new analytical approach to get front-end crash data. It is a systems approach to the vehicle as a structure experiencing high impact loads in a crash against a barrier. A safety task force developed three major tools to accomplish its mission. The first tool is a computer simulation of vehicle-barrier tests which predicts the dynamic response of the car's forestructure in a barrier impact. The second tool is the "static crusher" which permits evaluation of proposed component design. The third, still under development, is an elastic model of the passenger compartment which is intended to provide figures on stresses sustained by members resulting from frontal and inertial forces.

Search terms: Impact tests; Accident simulation; Computerized test methods; Crush tests; Static compression tests; Passenger compartments; Test equipment; Test facilities; General Motors Corp. Front end collisions; Crash response forecasting; Stress (mechanics)

HS-010 212 Fld. 5/4

THE DYNAMIC TRANSFER CHARACTERISTICS OF RECIPROCATING ENGINES

by D. E. Bowns

Published in *Institution of Mechanical Engineers Proceedings 1970-71* v185

Prepared for presentation to Institution of Mechanical Engineers, London, 13 Jan 1971.

The methods of sampled data analysis and small perturbation techniques are used to predict the dynamic characteristics of reciprocating engines. Extensive frequency response tests have been carried out on a compression ignition engine to determine dynamic characteristics and the results agree well with the theoretical predictions. A method of plotting the results is suggested which has the advantage of generality and takes into account engine speed changes and load torque-speed characteristics. The experimental methods used involve the use of electro-hydraulic systems. These have great advantages for providing the appropriate input and loading conditions. While the main body of the report is concerned with the theory and testing of compression ignition engines, the methods suggested can be applied equally well to petrol engines.

Search terms: Reciprocating engines; Engine tests; Torque; Engine performance; Engine speeds; Mathematical models; Engine operating conditions; Loading tests; Frequencies

HS-010 213 Fld. 5/4

THE EFFECT OF EXTRANEOUS FACTORS ON THE DEVELOPMENT OF TEST METHODS

by M. A. W. Hall

Published in *Institution of Mechanical Engineers Proceedings 1970-71* v185 n41/71 p519-24

3 refs

Prepared for presentation to Institution of Mechanical Engineers, London, 6 Apr 1971.

Comparative testing of cars for a con- information which is both technically valid and readily understood. Descriptions are given of the test program, a time-saving method of acceleration testing, handling measurements, and noise measurement. While standardized test methods are desirable, organizations often must retain their own methods.

Search terms: Automobile tests; Automobile handling; Acceleration; Performance tests; Vehicle noise; Standardization; Automobile comparisons; Automobile performance

HS-010 214 Fld. 5/4

THE 2-STAGE ROTARY ENGINE—A NEW CONCEPT IN DIESEL POWER

by F. Feller

Published in *Institution of Mechanical Engineers Proceedings 1970-71* v185 n13/71 p139-58

2 refs

Prepared for presentation to Institution of Mechanical Engineers, London, 9 Dec 1970 and at Automotive Engineering Congress, Detroit, 11-15 Jan 1971.

The report covers a period of six years of research leading to the design and manufacture of a compression ignition rotary engine of 350 hp for use in military vehicles. The work carried out to obtain good combustion and effective gas sealing is described in some detail. Outline drawings and data of the new engine are given and size comparisons are made with present-day engines.

Search terms: Rotary engines; Engine design; Compression ratio; Combustion; Wankel engines; Diesel engines;

HS-010 215 Fld. 5/4; 5/2; 5/20

CHARACTERISTICS AND CONTROL OF CAR, TRUCK AND BUS NOISE

by James A. Groening

General Motors Proving Ground

1971 4p

Report no. GM-Eng-Pub-4648

Presented at Purdue University Conference on Noise Control, Lafayette, Ind., 14 Jul 1971.

The specific purpose of this paper is to describe the factors which must be considered in quieting highway vehicles, specifically trucks, cars, and buses. The relative importance of various noise sources on each of these vehicles is discussed, and the sources are then considered individually. It is concluded that the changes needed to significantly reduce noise of vehicles will require a cost penalty which will eventually be borne by the consumer. It will also require compromise with other factors, such as the amount of leg room in a car. Solutions to some of these problems are not known at this time, and time will be required in any case, when solutions are found, to implement those solutions in terms of production hardware.

Search terms: Acceleration noise; Brake noise; Engine noise; Exhaust noise; Tire noise; Acoustic measurement; Vehicle noise; Fan noise; Noise control; Trucks; Buses; Automobiles

5/6 Fuel Systems

HS-010 216 Fld. 5/6

POSITIVE CRANKCASE VENTILATION

by John Mills

Published in *Design and Components in Engineering* p16-9 (21 Jan 1970)

Positive crankcase ventilation systems are described. The contribution of crankcase emissions to the smog problem is discussed.

Search terms: Vehicle air pollution; Crankcase emission control; Crankcase ventilation systems; Positive crankcase ventilation; Blowby; Smog; Air pollution emission factors

HS-010 217 Fld. 5/6

AIR POLLUTION CONTROL PROCESSES AND EQUIPMENT 1968. REMOVING AUTOMOTIVE EXHAUST FUMES FROM AIR

by Marshall Sittig

Published in *Chemical Process Review* n24 p208-58 (1968)

Automobile exhaust fumes account for over 60 percent of the total tonnage of pollutants of the five major sources—motor vehicles, industry, power plants, space heating, and solid waste disposal. Devices discussed include: a flame detector for exhaust gas analysis; diesel exhaust control devices; emission control devices for the internal combustion engine, including catalytic reactors, direct flame afterburners, and exhaust manifold air oxidation reactors; exhaust scrubber devices for use in mines; noncatalytic afterburners with regenerative heat exchangers; catalytic mufflers; catalytic exhaust purifiers; catalytic converters with rotating catalyst bed; air injection devices.

Search terms: Air pollution control devices; Catalytic converters; Dual bed catalyst systems; Heat exchangers; Air injection reactor systems; Mining; Mufflers; Air pollution sources; Air pollution emission factors; Exhaust emission control devices; Flame ionization detectors; Exhaust gases; Diesel engine exhaust emissions; Internal combustion engines; Afterburners; Exhaust manifold reactors; Manifold

HS-010 218 Fld. 5/6

PRESENT AND FUTURE PROJECTED SYSTEMS FOR EXHAUST POLLUTION CONTROL

Anonymous

Published in *Automotive Design Engineering* v10 p37-9 (Jun 1971)

A drawing shows the total emission control package necessary for conversion of the U. K. high-volume Austin-Morris 1100/1300 car to the Austin America variant as supplied to the North American market. This is followed by a report of extensive Ford-initiated development work leading to possible future systems to solve the demanding legislative requirements for the 1975 USA model year. Systems described include: evaporative loss control and air-injection reactor system; catalyst systems; and thermal reactors.

Search terms: Catalytic converters; Thermal reactors; Air injection reactor systems; Evaporative emission control devices; British vehicles; Emission standards; Exhaust emission control devices

HS-010 219 Fld. 5/6

THE EFFECT OF THE METHOD OF GAS ADMISSION ON PERFORMANCE OF A SPARK-IGNITION GAS ENGINE

by G. P. Mitchell; N. D. Whitehouse

Published in *Institution of Mechanical Engineers Proceedings 1970–71* v185 n26/71 p571-82

10 refs

This paper reports on the effect of position and timing of gas admission on the performance of a spark-ignition engine using methane. The investigation was aimed at exploring the effect of design limitations experiences with turbocharged medium speed engines. Re-

HS-010 219 (Cont'd.)

consumption and mostly at fixed air/gas ratios and are not, therefore, necessarily directly applicable to commercial engines. For near stoichiometric air/gas ratios, optimum performance was obtained most easily by early and prolonged gas admission. Better thermal efficiency was obtained with weak mixtures, about 80 percent of stoichiometric, and optimum gas admission was generally less obvious. Performance patterns did not vary consistently with gas admission timing; they improved or deteriorated with late gas admission, depending on the type of air inlet valve – presumably owing to air motion and gas/air mixing in the cylinder. Cyclic dispersion was probably minimal when the mixture around the spark was at or near stoichiometric and was most easily achieved by perfect mixing when the overall mixture was near stoichiometric.

Search terms: Engine performance; Combustion; Fuel consumption; Fuel induction; Fuel mixtures; Mathematical models; Intake manifolds; Cylinder pressure; Stoichiometry; Diesel engines; Turbocharging; Air fuel ratios; Spark ignition engines; Engine spelds; Intake valves

HS-010 220 Fld. 5/6

SOME PROBLEMS AND DEVELOPMENTS IN THE FIELD OF AUTOMOTIVE LUBRICATION

by A. Towle

Published in *Institution of Mechanical Engineers Proceedings 1970–71* v185 n1/71 p1-20

19 refs

Prepared for presentation to Institution of Mechanical Engineers, London, 28 Sept 1970.

The development of lubricants for passenger cars and commercial vehicles is reviewed. Comparisons are made between various current lubricant specifications, European and American, and numerous test procedures are described. Aspects discussed include: engine oils, both gasoline and diesel; piston ring and cylinder bore scuffing; preignition; cam and tappet wear; emulsion sludge; oil thickening; hot starting; diesel engine sludging; driveline lubricants; automatic transmissions; manual gearboxes; tractor lubrication; synthetic oils.

Search terms: Lubrication; Lubricant additives; Lubricating oils; Lubricating oil tests; Diesel engines; Engine deposits; Sludge; Engine wear; Automatic transmissions; Preignition; Cylinders; Drivelines; Piston rings; Lubricants; Gear boxes; Specifications

HS-010 221 Fld. 5/6

THE DEVELOPMENT OF AN ELECTRONICALLY CONTROLLED PETROL INJECTION SYSTEM

by B. H. Croft

Published in *Institution of Mechanical Engineers Proceedings 1970-71* v185 n9/71 p95-107

Prepared for presentation to Institution of Mechanical Engineers, Birmingham, 25 Nov 1970.

Requirements for higher power with good driveability and control of exhaust emissions motivated a study of fuel injection. Consideration of the control requirements and accuracy necessary led, at an early stage, to the selection of electronic control on the basis of control capability, long term reliability, relatively low cost, and the potential for future development. The fuel system was designed around the electronic control, manifold injection being used instead of direct injection on the basis of simplicity, lower cost, and greater installation flexibility. The system is described in some detail and typical examples of the system performance on vehicles are presented.

Search terms: Electronic fuel injection; Engine design; Engine performance; Engine tests; Fuel systems; Exhaust emission control; Fuel economy; Sensors; Manifolds; Time factors; Air fuel ratio; Engine operating conditions

HS-010 222 Fld. 5/6

A NEW COMPUTATION MODEL OF COMBUSTION IN THE SPARK-IGNITION ENGINE

by W. J. D. Annand

Published in *Institution of Mechanical Engineers Proceedings 1970–71* v185 n11/71 p119-26

21 refs

The paper presents an attempt to embody, in a calculation of the combustion and expansion phases of the working cycle of a spark-ignition engine, a representation of the observed fact that reaction is not completed in the flame front, but is continued in the enflamed gases. It is argued that the secondary reaction consists mainly in the transformation of excess carbon monoxide to dioxide, and crude representations of the formation of the excess and the rate of transformation are adopted. Results of computations made in this way conform with observation better than those made on the assumption of chemical equilibrium behind the flame front, and help to explain some experimental findings.

Search terms: Spark ignition engines; Combustion; Flame propagation; Carbon monoxide; Carbon dioxide; Cylinder pressure; Time factors; Air fuel ratio; Mathematical models; Engine operating conditions

5/9 Inspection

HS-010 223 Fld. 5/9

WEAK POINTS OF CARS, 1969

Svensk Bilprovning A.B. (Sweden)

1969 127p

General results of periodic vehicle inspections during the first half of 1969 are described. Of a total of 951,215 vehicles inspected, a statistical analysis was made of the records of 31,000 automobiles manufactured in 1966. Of the vehicles inspected, 26.0% were passed with clean records while 48.1% were passed with one or more remarks concerning faults. The remaining 25.9% were failed. Of the private cars that failed, 9.1% had just one defect, whereas 53.5% had four or more, and 13.5% had seven or more faults.

Search terms: Vehicle inspection; Defective vehicles; Automobile models; Statistical analysis; Automobile defects; Vehicle age

HS-010 224 Fld. 5/9

WEAK POINTS OF CARS, 1970

Svensk Bilprovning A.B. (Sweden)

1970 95p

The general results of periodic vehicle inspections during the first half of 1970 are described. Of a total of 990,710 vehicles inspected, a statistical analysis was made of the records of about 40,500 inspection records selected at random. The main concern in this report was to present the results of the inspections carried out on private cars with the model year designations 1965 and 1967. These results are based on control inspections during the first quarter of 1970. Of the vehicles inspected, 29.0% were passed with clean records while 44.6% were passed with one or more remarks concerning faults. The remaining 26.3% were failed. Of all the private cars that were failed during the first half of 1970, only 8.7% had just one defect, whereas 58.0% had two to four faults and 33.4% had five or more faults.

Statistical analysis; Automobile defects; Vehicle age

5/14 Occupant Protection

HS-010 225 Fld. 5/14; 5/20

CODE H33 FARM TRACTOR, CODE H34 FRONT END LOADERS AND H24 TRACTORS — INSTALLATION OF ROLL BARS, SAFETY BELTS AND CABS

by G. A. Givens, comp.

Canada Central Experimental and Proving Estab.

1964 53p 1 ref
Report no. CEPE-1736; AD-454 433

Evaluation was made of the practicability and usefulness of roll bars and safety belts on tractors, particularly when fitted with cabs or canopies. Cabs, roll bars, and safety belts were mounted on a code H24 crawler tractor, a code H33 agricultural tractor, and a code H34 front end loader. It was determined that the roll bars are adequate and safe, providing the seat belts are fastened. It was concluded, however, that the roll bars were uneconomical for universal installation on all RCAF tractors because the tractors are normally operated on smooth terrain. Canvas overhead protection, at a small cost, without roll bars, was recommended for the Code H24 and Code H33 tractors. A permanent cab was recommended for the Code H34, without roll bars. This vehicle is very stable in operation and is required during all types of inclement weather. It is recommended that tractors used on hilly and rough terrain should have roll bars.

Search terms: Farm tractors; Construction vehicles; Roll bars; Safety belts; Occupant protection; Tractor cabs; Seat belts; Vehicle stability; Ground roughness; Rollover protective structures; Specifications

5/15 Propulsion Systems

HS-010 226 Fld. 5/15

THE WANKEL REVOLUTION

by Mark D. Zimmerman

Published in *Machine Design* v43 n1 p85-91 (7 Jan 1971)

Nineteen licensees based in seven countries can now legally develop, build, and sell Wankel engines. Three license agreements were just concluded in the last three months; one involved General Motors who could push the engine into worldwide prominence. Altogether, there are 21 firms working on the Wankel; most are world-standard setters in various phases of engine and vehicle design.

Search terms: Wankel engines; Foreign automobiles; Air cooled engines; Engine design; Licensing

HS-010 227 Fld. 5/15; 5/6

THE STEAM CAR MAY RETURN

by Clifford B. Hicks

Published in *World Book Encyclopedia, Science Yearbook* p156-67 (1971)

Pollutants from the internal combustion engine and their threat to health, some modifications to make it cleaner, and the necessity of alternative power sources are reviewed. Electric cars and turbine cars have more handicaps than steam cars. Various developments in steam propulsion, operating fluids, and development costs, are reviewed.

Search terms: Steam automobiles; Electric automobiles; Gas turbine automobiles; Internal combustion engines; Air pollution emission factors; Air pollution control; Air pollution

5/18 Steering Control System

HS-010 228 Fld. 5/18; 4/7

DESIGN OF ACTIVE SUSPENSIONS

A. G. Thompson

Published in *Institution of Mechanical Engineers Proceedings 1970–71* v185 n36/71 p553-63

17 refs

The synthesis method is employed for the design of servo-suspensions of the electrohydraulic type. Two alternative arrangements are considered in which the hydraulic actuators and the body support springs are respectively in series and in parallel. The achieved designs for active suspensions of this type are superior to conventional systems both in ride quality and in overall stiffness to resist body load forces, but slightly less effective in regard to road-holding. If dynamic absorbers are used for the control of axle vibrations, it is shown that considerably greater improvements in ride quality than hitherto possible may be obtained with the aid of an additional feedforward compensating signal flow path. The derivation of the necessary compensation circuits to achieve the specified overall system performances is demonstrated by examples. A simple method of banking control of the vehicle by inclined sensing accelerometers is suggested.

Search terms: Mathematical analysis; Mathematical models; Suspension systems; Degrees of freedom; Vehicle dynamics; Vehicle stability; Vehicle riding qualities; Vibration; Axles; Vehicle control; Springs; Loads (forces); Accelerometers; Hydraulic equipment

by Jerry Copeland

Published in *Popular Science* v198 n3 p74-5, 132 (Mar 1971)

Advice on how to install the right camper in the right pickup truck is given. First you have to know the rated gross vehicle weight of the truck. Subtract truck weight from the gross vehicle weight and you have the payload weight. The payload includes the camper and everything else carried (people and gear). The camper should be selected first. The weight distribution should be ideally 40 percent on the front axles and 60 percent on the rear axles. The camper should be fastened to the truck frame. Details about the right kind of equipment, the tires to use, and performance tests are given.

Search terms: Campers (truck mounted); Vehicle weight; Weight distribution; Vehicle weight limits; Pickup trucks; Truck tires

5/22 Wheel Systems

HS-010 230 Fld. 5/22

FIRESTONE'S CAST CORDLESS TIRE

by Glen Alliger; W. A. Smith; F. M. Smith

Published in *Rubber World* v164 n3 p51-5 (Jun 1971)

Using a low hysteresis, chain-extendable, crosslinkable liquid rubber, Firestone claims that it can cast such completely uniform tires that even the need for tire balancing can be eliminated. The cast tire is conventional in shape and appearance and can be made in colors. Cast

Search terms: Tire deflection; Tire design; Tire tests; Cast tires; Tire characteristics; Tire uniformity; Cordless tires; Tire riding characteristics; Tire wear resistance; Tire failure simulators; Tire inflation pressure

HS-010 231 Fld. 5/22

A LABORATORY PNEUMATIC TYRE TESTING RIG

by B. D. A. Phillips

Published in *Institution of Mechanical Engineers Proceedings 1970–71* v185 n35/71 p525-35

7 refs

A tire testing rig which has recently been designed and constructed at the Lanchester Polytechnic, Coventry, is described. The rig measures the six force and moment components acting in the contact patch of a tire rolling slowly on a flat continuous surface for a wide range of slip angles, camber angles, tire pressures, and wheel loads. Either driving or braking torques can be applied to the wheel axles, and both the slip angle and the lateral displacement of the wheel can be varied sinusoidally or instantaneously in order to investigate the frequency responses and step responses of tires.

Search terms: Tire test equipment; Tire force measurement; Tire pavement interface; Laboratory tests; Tire moments; Tire slip motion; Camber; Torque; Lateral force

HS-010 232 Fld. 5/22; 5/20

CARE AND SERVICE OF TRUCK TIRES

correct inflation, overinflation, underinflation; load distribution, overloading; effect of heat; rapid tread wear; mechanical irregularities; matching of duals; tire rotation; tube abuse, tube mounting; rims for tubeless tires; mounting and demounting tubeless tires; safety precautions in servicing tires; repair methods; and load and inflation tables.

Search terms: Truck tires; Tire inflation pressure; Tire wear; Tire tread depth; Tire maintenance; Tire inspection; Tire loads; Tire failures; Tire fires; Tire pairing; Tire pavement interface; Dual tires; Tire riding characteristics; Tire cuts; Rims; Tubeless tires; Tire mounting; Tire rotation; Loading (mechanical); Tire safety; Inner tubes; Tire repair; Tire temperature

NHTSA DOCUMENTS

NHTSA Contractors Reports

HS-800 510 Fld. 4/2

COMMUNITY ACTION PROGRAM FOR TRAFFIC SAFETY. GUIDE 9: ACTION PROGRAM

by Mel D. Powell; Michael K. Gemmell; Donald Murray; Warren P. Howe

National Assoc. of Counties Res. Foundation

1970 39p
Contract FH-11-7091

This report is the ninth and last in a series of guidebooks that describes the various legal, organizational, and administrative techniques and principles available and necessary for the management of local traffic safety programs. This final guide discusses the need for developing action plans for the action programs. Basically, the guide discusses the role of federal, state, and local governments and the private sector in traffic safety, and presents recommendations. Appendices include the text of the Highway Safety Act of 1966 and the sixteen Highway Safety Program Standards.

Search terms: Highway Safety Act of 1966; Highway safety; Federal state relationships; Highway safety programs; Local government; State government; Highway safety standards; Community support; Highway safety organization management

AVAILABILITY: NTIS $3.00

HS-800 511 Fld. 5/11

MAINTAINABILITY AND REPAIRABILITY OF VEHICLES-IN-USE. VOL. 2. TECHNICAL REPORT

Booz Allen Applied Res., Inc.

Jun 1970 700p 76 refs
Contract FH-11-7593
Report no. 9073-035-001-Vol-2

In this study the problems and requirements for maintenance and repair of safety critical vehicle components and systems are studied for vehicles less than 8,000 lbs. Solutions which minimize tasks and reduce costs are presented. Repair industry problems related to mechanic skill requirements are discussed and recommendations are presented. A parts failure rate data format is developed, and a detailed three year summary of maintenance and repair data from a major leasing fleet is tabulated. The study concludes that the major vehicle design factors that affect maintenance and repair are accessibility, complexity, durability and diagnosis. It is estimated that a 30 percent reduction in safety related maintenance and repair can be achieved by design changes which have minimal impact on initial cost. Recommended government action is discussed.

Search terms: Automobile maintenance; Maintainability; Repair industry; Mechanics (personnel); Automobile repair costs; Automobile design; Serviceability; Federal control; Repair equipment; Preventive maintenance; Accessibility; Durability; Automobile maintenance; Failures; Automotive parts; Defects; Preventive maintenance; Accessibility; Durability

HS-800 512 Fld. 5/11

MAINTAINABILITY AND REPAIRABILITY OF VEHICLES-IN-USE. VOL. 1. SUMMARY REPORT

Booz Allen Applied Res., Inc.

1971 42p
Contract FH-11-7593
Report no. 9073-035-001-Vol-1

In this study the problems and requirements for maintenance and repair of safety-critical vehicle components and systems are studied for vehicles less than 8,000 lbs. Solutions which minimize tasks and reduce costs are presented. Repair industry problems related to mechanic skill requirements are discussed and recommendations are presented. A parts failure rate data format is developed, and a detailed three year summary of maintenance and repair data from a major leasing fleet is tabulated. The study concludes that the major vehicle design factors that affect maintenance and repair are accessibility, complexity, durability, and diagnosis. It is estimated that a 30 percent reduction in safety related maintenance and repair can be achieved by design changes which have minimal impact on initial cost. Recommended government action is discussed.

Search terms: Maintainability; Repair industry; Mechanics (personnel); Automobile repair costs; Automobile design; Serviceability; Federal control; Repair equipment; Preventive maintenance; Accessibility; Durability; Automobile maintenance; Failures;

HS-800 517 Fld. 4/5

DESIGN REPORT FOR THE NHSB INFORMATION AND DATA SYSTEM. VOL. 1: SYSTEM OVERVIEW. FINAL REPORT

Westinghouse Electric Corp.

1971 111p
Contract FH-11-7421
Report no. R-71-101

Report for 19 Dec 1969–31 Dec 1970.

A system overview is presented, reviewing the design philosophy and providing a summary of the system design of the Information and Data System (IDS) for the National Highway Safety Bureau. This report provides a blueprint for the coordination and development of the Bureau's data activities for the fiscal years 1971 through 1976.

Search terms: Information system design; Data processing; Data acquisition; Data analysis; Computerized records management; Information retrieval; Computerized driver records; Hignway safety organizations; Flow charts; Automated accident records; National Highway Traffic Safety Administration

AVAILABILITY: NTIS $3.00

HS-800 518 Fld. 4/5

DESIGN REPORT FOR THE NHSB INFORMATION AND DATA SYSTEM. VOL. 2: PROGRAM SUMMARY. FINAL REPORT

Westinghouse Electric Corp.

1971 67p
Contract FH-11-7421
Report no. R-71-102

Report for 19 Dec 1969–31 Dec 1970.

This volume summarizes the history of the Information and Data System project, methods of operation, technical approaches, and achievements. The report presents contract requirements, and details the method in which these requirements were accomplished. Additionally, a chronological narrative spanning twelve-months achievements and a summary table of required and delivered items are included.

Search terms: Computerized records management; Data acquisition; Data processing; Information retrieval; Highway safety organizations; Federal state relationships; Information system design; History; National Highway Traffic Safety Administration

AVAILABILITY: NTIS $3.00

HS-800 519 Fld. 4/5

DESIGN REPORT FOR THE NHSB INFORMATION AND DATA SYSTEM. VOL. 3: DETAILED DESIGN SPECIFICATIONS FINAL REPORT

Westinghouse Electric Corp.

1971 530p
Contract FH-11-7421
Report no. R-71-103

Report for 19 Dec 1969–31 Dec 1970.

This volume presents the detailed design for the National Highway Safety Bureau Information and Data System (IDS). These detailed design specifications cover all elements of each of the three Information and Data System components–the basic state, the prototype state, and NHSB operations.

Search terms: Highway safety organizations; Information system design; Data acquisition; Data processing; Information retrieval; Real time operations; Computerized records management; National Highway Traffic Safety Administration; Flow charts; Information systems; Directories

AVAILABILITY: NTIS $6.00

HS-800 520 Fld. 4/5

DESIGN REPORT FOR THE NHSB INFORMATION AND DATA SYSTEM. VOL. 4: THIRD STAGE PLANNING AND DESIGN CRITERIA. FINAL REPORT

Westinghouse Electric Corp.

1971 40p
Contract FH-11-7421
Report no. R-71-104

Report for 19 Dec 1969–31 Dec 1970.

This volume presents a projection of the NHSB Information and Data System beyond the second stage design concept. The second stage covers the period from the present to about 1976 while the third stage covers the ensuing years of the decade into 1980. The planning and design features relevant to the third stage are discussed in terms of how changes in hardware and software technology, user needs, and data requirements will affect the form and features of the IDS.

Search terms: Highway safety organizations; Information system design; Data acquisition; Data processing; Data analysis; Information retrieval; National Highway Traffic Safety Administration; Flow charts

AVAILABILITY: NTIS $3.00

HS-800 521 Fld. 4/5

DESIGN REPORT FOR THE NHSB INFORMATION AND DATA SYSTEM. VOL. 5: IMPLEMENTATION PLAN AND FIVE-YEAR INVESTMENT. FINAL REPORT

Westinghouse Electric Corp.

1971 402p
Contract FH-11-7421
Report no. R-71-105

Report for 19 Dec 1969–31 Dec 1970.

This volume presents the time-phased implementation plan and detailed estimates of the investment necessary for the total Information and Data System through fiscal year 1976.

Search terms: Computerized records management; Data acquisition; Data processing; Information retrieval; Highway safety organizations; Federal state relationships; National Highway Traffic Safety Administration; Economic analysis; Information system design

AVAILABILITY: NTIS $6.00

HS-800 522 Fld. 4/5

DESIGN REPORT FOR THE NHSB INFORMATION AND DATA SYSTEM. VOL. 6: PROCUREMENT SPECIFICATIONS. FINAL REPORT

Westinghouse Electric Corp.

1971 165p
Contract FH-11-7421
Report no. R-71-106

Report for 19 Dec 1969–31 Dec 1970.

This volume presents the procurement specifications for the Information and Data System software and computer services. These procurement specifications are designed to ensure that the software provides a flexible user-oriented data processing capability adaptable to non-programmer application.

Search terms: Computerized records management; Data acquisition; Data processing; Information retrieval; Highway safety organizations; Federal state relationships; National Highway Traffic Safety Administration

AVAILABILITY: NTIS $3.00

HS-800 525 Fld. 5/9; 5/17

VEHICLE INSPECTION DEMONSTRATION PROJECT. ANNUAL REPORT

by Wiley W. Godsey

District of Columbia Dept. of Motor Vehicles

1971 47p
Contract FH-11-7191

Includes as appendix annual report 1970.

A real-time computer system was established, capable of providing the inspection station with a complete vehicle history, including current inspection status, vehicle registration, and vehicles involved in accidents or safety defect recall campaigns. It was concluded that the technical feasibility of using compacted vehicle identification numbers has been proven; that special inspection data sampling can be accomplished during the normal inspection process; that the project has provided valuable decision making information; that data should be collected on the relation of vehicle components to safety; and that all jurisdictions should adopt uniform and objective motor vehicle inspection programs. It is recommended that a comprehensive management information system be developed and that this demonstration project should be expanded.

Search terms: Vehicle inspection; Recall campaigns; Defective vehicles; Inspection equipment; Inspection records; Inspection stations; Demonstration projects; Vehicle identification numbers; Decision making; Information systems; Vehicle characteristics

HS-800 527 Fld. 5/14; 4/7

HSRI TWO-DIMENSIONAL CRASH VICTIM SIMULATOR: ANALYSIS, VERIFICATION, AND USERS' MANUAL. FINAL REPORT

by D. H. Robbins; R. O. Bennett; V. L. Roberts

Michigan Univ. Hwy. Safety Res. Inst.

1970 264p 28 refs
Contract FH-11-6962
Report no. HSRI-Bio-M-70-8

This report deals with the development and use of mathematical models for the simulation of automobile occupant kinematics in the event of a collision. This model was developed as a tool to study advanced concepts and designs of seat-restraint systems from the viewpoint of occupant protection. After a discussion of the state-of-the-art of mathematical modeling of the crash victim, an analytical description of the HSRI two-dimensional crash victim simulator is presented. This model consists of a segmented, eight-mass dynamic model of a human interacting with the interior of a vehicle in a symmetric frontal or rear crash. The degree to which predictions of the model agree with experimental impact sled test data is presented, and the report concludes with a detailed users' manual for those individuals desiring to exercise the HSRI two-dimensional crash victim simulator.

Search terms: Occupant vehicle interface; Accident simulation; Occupant kinematics; Human body kinematics; Mathematical models; Computerized simulation; Computer programs; Impact sleds; Impact tests; Impact protection; Flow charts; Simulation models; Human body simulattion; Restraint systems; Front end collisions; Rear end collisions; Human body segment parameters; Human body impact tolerances

NHTSA Contractors Reports (Cont'd.)

HS-800 528 Fld. 5/14; 4/7

DEVELOPMENT AND TESTING OF INTEGRATED SEAT RESTRAINT SYSTEMS. FINAL REPORT

by D. H. Robbins; V. L. Roberts; A. W. Henke; D. F. Raney; R. O. Bennett; J. H. McElhaney

Michigan Univ. Hwy. Safety Res. Inst.

1970 78p 12 refs
Contract FH-11-6962
Report no. HSRI-71-122

Report for 1 Jul 1968–30 Jun 1971.

The objective of this research was to develop, fabricate, and test seat and restraint system combinations designed to offer a level of protection exceeding that found in current production seats and restraint systems. To accomplish this a series of analytical studies was carried out using two-and three-dimensional mathematical models of an automobile crash victim. These studies, in combination with a survey of the state of the art of seating and restraint systems, were used to formulate design concepts of integrated seat restraint systems. The most promising of the active systems was fabricated and subjected to front, oblique, side, and rear impact tests using anthropometric dummies. The results of these tests were compared with current production seating systems and with the initial predictions of the mathematical models. Recommendations are made concerning performance requirements and compliance procedures for integrated seat restraint systems and for passive front seat occupant restraint systems.

Search terms: Air bag restraint systems; Occupant protection; Restraint systems; Passive restraint systems; Impact protection; Deceleration; Shoulder harnesses; Three point restraint systems; Mathematical models; Anthropometric dummies; Seat design

AVAILABILITY: NTIS $3.00

HS-800 530 Fld. 1/1

THE FEASIBILITY OF DEVELOPING AN EXPERIMENTAL HELICOPTER AMBULANCE SERVICE IN THE WASHINGTON METROPOLITAN AREA

Metropolitan Washington Council of Governments

1969 74p
Contract FH-11-6853

The feasibility of a helicopter ambulance program for the greater Washington, D. C. area has been examined to define the services such a program could supply and the means of integrating these services into the existing ground crash rescue systems. Although information necessary to analyze the quality and determine specific deficiencies in the existing systems was not available, two demonstration plans were developed that would permit evaluation of a helicopter ambulance service under actual conditions of use.

Search terms: Helicopter ambulances; Emergency medical services; Ambulances; Time factors; Demonstration projects; Feasibility studies; Benefit cost analysis

AVAILABILITY: A reference copy only is in NHTSA Technical Reference Div.; no copies available for distribution

HS-800 533 Fld. 5/14

LAP AND SHOULDER RESTRAINTS FOR PREGNANT WOMEN. FINAL REPORT

1971 65p 4 refs
Contract FH-11-6970

To be published in 15th Stapp Car Crash Conference Proceedings.

A series of 24 pregnant baboons were impacted under similar conditions. The only major variable was the difference in maternal restraint. The fetal death rate of 8.3 percent (1/12) among maternal animals impacted with three-point restraint was significantly different from five fetal deaths among 10 maternal animals impacted under lap belt restraint alone. It is concluded that shoulder harness restraint should be recommended for use by pregnant women as being significantly more protective of fetal welfare when compared with lap belt restraint alone.

Search terms: Three point restraint systems; Fetal death; Uterine injuries; Baboons; Seat belt caused injuries; Impact sleds; Animal experiments; Animal impact tolerances; Female injuries; Pregnancy; Abdominal impact tolerances; Shoulder harnesses

AVAILABILITY: NTIS $3.00

HS-800 553 Fld. 3/0

EXPANSION OF VOCATIONAL-TECHNICAL SCHOOL PROGRAMS TO ACCOMMODATE HIGHWAY SAFETY MANPOWER REQUIREMENTS. FINAL REPORT

by Ronald D. Daugherty; Carroll R. Hyder; W. Kent Brooks

Ohio State Univ.

1971 122p 215 refs
Contract FH-11-7507

The support of state and local organizations for vocational and technical education was enlisted to help develop existing training programs and to add new pro-

model incorporating highway safety program objectives and related occupations. A survey was conducted to locate established programs, to identify leading educational personnel, and to collect curriculum material. Thirteen conclusions are presented, and eighteen recommendations are made concerning the development of state and local programs, highway safety occupations, career literature, training programs, and curriculum and materials.

Search terms: Manpower utilization; Education; Safety education; Questionnaires; Federal state relationships; Curricula; Surveys; Community support; Instruction materials; Bibliographies

AVAILABILITY: NTIS $3.00

HS-800 555 Fld. 3/0

EXPANSION OF VOCATIONAL-TECHNICAL SCHOOL PROGRAMS TO ACCOMODATE HIGHWAY SAFETY MANPOWER REQUIREMENTS. VOL. 1. INTRODUCTION

by Aaron J. Miller; Ronald D. Daugherty; W. Kent Brooks; Carroll R. Hyder

Ohio State Univ.

1970 40p 10 refs
Contract FH-11-7507

Highway safety manpower needs at the state level are examined. An estimated 65,000 safety specialists were employed in 1968 and about 95,000 should be needed by 1977. Needs are estimated yearly 1968-1977 for each of the sixteen highway safety program standards. A safety manpower survey of local governments is included.

Search terms: Manpower utilization; State government; Education; Safety education; Highway safety programs; Highway safety standards; Local government

AVAILABILITY: NTIS $3.00

HS-800 556 Fld. 3/0

EXPANSION OF VOCATIONAL-TECHNICAL SCHOOL PROGRAMS TO ACCOMODATE HIGHWAY SAFETY MANPOWER REQUIREMENTS. VOL. 2

by Ronald D. Daugherty; W. Kent Brooks; Carroll R. Hyder

Ohio State Univ.

1970 156p 163 refs
Contract FH-11-7507

This volume covers vocational-technical programs for: motor vehicle inspection, motor vehicle registration, motorcycle safety, driver education, driver licensing, traffic safety schools, general safety education, codes and laws, and traffic courts. It presents occupational summaries, manpower requirements and availability, program curricula and topical outlines, and relationships to the highway safety standards.

Search terms: Manpower utilization; Education; Safety education; Curricula; Instruction materials; Highway safety programs; Vehicle inspection; Vehicle registration; Motorcycle safety; Driver education; Traffic courts: Inspector training; Instructors; Driver license examiners; Driver improvement schools; Highway safety standards

AVAILABILITY: NTIS $3.00

HS-800 557 Fld. 3/0

EXPANSION OF VOCATIONAL-TECHNICAL SCHOOL PROGRAMS TO ACCOMODATE HIGHWAY SAFETY MANPOWER REQUIREMENTS. VOL. 3

by Ronald D. Daugherty; W. Kent Brooks; Carroll R. Hyder

Ohio State Univ.

1971 172p refs
Contract FH-11-7507

This volume covers vocational-technical programs for: alcohol in' relation to highway safety, identification and surveillance of accident locations, traffic records, emergency medical services, and highway design, construction, and maintenance. It presents occupational summaries, manpower requirements and availability, program curricula and typical outlines, and relationships to the highway safety standards.

Search terms: Manpower utilization; Traffic engineering; Education; Safety education; Curricula; Instruction materials; Highway safety programs; Alcohol breath tests; Alcohol chemical tests; Medical education; Accident investigation training; Accident location; Traffic records; Emergency medical services; Highway design; Highway construction; Highway maintenance; Highway engineering; Highway safety standards

AVAILABILITY: NTIS $3.00

HS-800 558 Fld. 3/0

EXPANSION OF VOCATIONAL-TECHNICAL SCHOOL PROGRAMS TO ACCOMODATE HIGHWAY SAFETY MANPOWER REQUIREMENTS. VOL. 4

by Ronald D. Daugherty; W. Kent Brooks; Carroll R. Hyder

Ohio State Univ.

1971 206p refs
Contract FH-11-7507

This volume covers vocational-technical programs for: traffic control devices, pedestrian safety, police traffic services, debris hazard control and clean up (at accident sites), and school bus safety. It presents occupational summaries, manpower requirements and availability, program curricula and topical outlines, and relationships to the highway safety standards.

Search terms: Manpower utilization; Education; Safety education;

NHTSA Contractors Reports (Cont'd.)

HS-800 558 (Cont'd.)

Curricula; Instruction materials; Highway safety programs; Traffic control devices: Pedestrian safety; Police traffic services; Debris removal; School bus safety; Traffic control; Traffic engineering; Highway safety standards; Police training; Traffic management; Accident investigation; Traffic law enforcement; School bus drivers

AVAILABILITY: NTIS $3.00

NHTSA Staff Speeches, Papers, etc.

HS-810 166 Fld. 3/1

THE NATIONAL HIGHWAY SAFETY BUREAU'S PROPOSED ALCOHOL COUNTERMEASURE PROGRAM

by Willard Y. Howell

National Hwy. Safety Bureau

1970 60p

Presented to the Governors' Highway Safety Representatives of the Northeastern Region, 28 Apr 1970.

The role alcohol plays in traffic accidents and the patterns under which it is consumed are discussed. Using blood-alcohol levels as a scientific measure of intoxication, investigations into alcohol-related traffic accidents have shown that more than half the drivers between 25 and 60 who are at fault have blood alcohol levels over 0.15%. A level of 0.10% is that proposed by the National Highway Safety Bureau as a legal definition of intoxication. It is estimated that there are three million alcoholics and four million heavy escape drinkers who drive. A four-part countermeasures program is proposed that will provide 100% federal support for state and community highway safety programs; new countermeasures, equipment, and procedures; a public to support or assist in these programs; and, a series of community-level model programs to provide for rehabilitation of the problem drinker.

Search terms: Alcohol blood tests; Drinking drivers; Alcohol usage; Driver intoxication; Alcohol effects; Accident responsibility; Highway safety programs; Alcohol usage deterrents; Problem drivers; Blood alcohol levels; Driver rehabilitation; Alcoholism; Social drinking

HS-810 167 Fld. 3/1

DRINKING AND DRIVING—A NATIONAL PROBLEM

by Willard Y. Howell

National Hwy. Traf. Safety Administration

1970 11p

Two-thirds of the alcohol-related traffic deaths are being caused by a small deviant minority of problem drinkers who can be identified and helped. This is the premise behind the IDA program: identification, decision, and action. The text for a slide presentation on the subject of alcohol-related deaths is presented without copies of accompanying slides.

Search terms: Drinking drivers; Blood alcohol levels; Alcoholism; Alcohol usage; Driver intoxication; Alcohol usage deterrents; Social drinking; Accident responsibility; Alcohol effects; Driver rehabilitation; Problem drivers

HS-810 168 Fld. 3/1

THE DRINKING DRIVER—AMERICAN DILEMMA

by Willard Y. Howell

National Hwy. Traf. Safety Administration

Part of the United States' problem with chronic drinking drivers stems from the almost universal acceptance of social drinking as part of our culture, which in turn leads to leniency by judges and juries. To begin an effective campaign to reduce the number of alcohol-related deaths, it is necessary to convince the general public that the large proportion of drinking drivers who are involved in traffic accidents are not social drinkers but problem drinkers, usually with a record of repeated traffic offenses, who are sick and in need of medical assistance, and for whom punishment is no deterrent.

Search terms: Alcoholism; Alcohol usage; Drinking drivers; Blood alcohol levels; Alcohol breath tests; Social drinking; Driver intoxication; Problem drivers; Alcohol effects; Traffic law enforcement; Driver rehabilitation; Alcohol usage deterrents; Alcohol education

HS-810 172 Fld. 4/4

R AND D HIGHWAY AND SAFETY TRANSPORTATION SYSTEM STUDIES 1970

Federal Hwy. Administration; National Hwy. Safety Bureau

1970 333p

Report for fiscal year 1 Jul 1969–30 Jun 1970.

This publication provides a compilation of on-going research and development activity being sponsored or performed by the Federal Highway Administration and the National Highway Safety Bureau. The assembly represents a first attempt to bring together in a single document a listing of all research and development studies of the two agencies, classified according to a common set of standards or definitions. By organizing the list of studies in such manner, a comprehensive overview of highway-related research and development work in progress at a given point in time is

agencies as well as interested individual users. In addition, this combined listing, organized according to the Research and Development Information System developed by the Federal Highway Administration, shows how the programs and objectives of the two organizations are interrelated and reflects their wide scope and diversity.

Search terms: Highway research; Highway safety; Indexes; Contracts; Federal aid; Bibliographies; Transportation studies; Highway transportation; Traffic capacity; Driver behavior; Forecasting

AVAILABILITY: GPO $2.50

NHTSA Imprints

HS-820 104 Fld. 5/22

TIRES, A COMPARISON OF TIRE RESERVE LOAD FOR 1971 PASSENGER CARS.

National Hwy. Safety Bureau

Published as *Consumer Aid Series* v1 pt2 36p (Oct 1970)

This publication is a listing of the lowest tire reserve loads recommended by auto manufacturers. These loads are listed in descending order of performance, the best reported tire reserve load first. Tire reserve load is a measure of excess tire-load-carrying capacity—the percentage by which the rated load (load-carrying capacity of the tire at a specific inflation pressure) exceeds the actual load placed on the tire when the vehicle is loaded to its maximum recommended capacity. The tires on the most heavily loaded axle are used as the basis for the computation.

Search terms: Tire load limits; Tire reserve load; Tire performance; Tire characteristics; Automobile models

AVAILABILITY: GPO $.40

HS-820 105 Fld. 5/1

BRAKES. A COMPARISON OF BRAKING PERFORMANCE FOR 1971 PASSENGER CARS

National Hwy. Safety Bureau

Published as *Consumer Aid Series* v1 pt1 33p (Oct 1970)

This publication presents the stopping distances reported by the individual auto manufacturers from 60 miles per hour with full operational brakes under the most adverse load condition. For ease of comparison these stopping distances are listed in descending order of performance, the best reported performance being listed first. For further ease of comparison of any single make/model with all others, the total performance spread of all makes/models is contained on each page.

Search terms: Stopping distance; Brake performance; Automobile models; Automobile performance

AVAILABILITY: GPO $.40

HS-820 158 Fld. 4/5

RESEARCH REPORTS OF THE NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION. A BIBLIOGRAPHY, 1967–MARCH 1971

National Hwy. Traf. Safety Administration

1971 191p

The research reports of the National Highway Traffic Safety Administration which are cited in this bibliography are the products of contracts that fulfill objectives of the administration in the fields of highway and motor vehicle safety. The bibliography is up-to-date as of March 1971.

Search terms: Highway safety; Bibliographies; Contracts; Vehicle safety; Indexes

AVAILABILITY: NTIS $3.00

executive summary

YNPOSIS OF A RECENTLY RELEASED NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION RESEARCH REP

DRIVER EDUCATION TASK ANALYSIS

The purpose for which this contract, FH-11-7336, was awarded, was to conduct a research study to develop a set of objective descriptions of tasks which comprise the driving performance of the passenger motor vehicle operator. Results of the study will be used in the development of improved driver education programs designed to upgrade the skills of motor vehicle operators.

Contract FH-11-7336
Human Resources Research Organization
300 North Washington Street
Alexandria, Virginia 22314

Award Amount: $219,249.00
Contract Research Period:
June 26, 1969 through
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DOT/HS-800 367 Vol. I: TASK DESCRIPTIONS — PB 197-325
DOT/HS-800 368 Vol. II: TASK ANALYSIS METHODS — PB 197-688

(For the synopsis on volumes I and II refer to Highway Safety Literature, HSL 71-22, dated August 13, 1971, pages 24-27.)

DOT/HS-800 369 Vol. III: Instructional Objectives — PB-202 247
DOT/HS-800 370 Vol. IV: The Development of Instructional Objectives — PB-202 248

Summary

In an effort to start young people on the road to safe driving, over 13,000 high schools across the country conduct programs of driver education. Through these programs, nearly two million students receive classroom and behind-the-wheel instruction each year. Under the Highway Safety Act of 1966, the National Highway Traffic Safety Administration (NHTSA) is responsible for issuing guidelines to assist the states in improving the quality of driver education programs. In several NHTSA-sponsored studies, attempts to evaluate the effectiveness of driver education programs have been hampered by a lack of an explicit description of what constitutes "good" driving. These studies have concluded that a necessary step in both the development and evaluation of sound driver education programs is an analysis of the driver's tasks. The driving behaviors identified through this analysis could serve as performance objectives from which would be derived the knowledges, skills, habits, and attitudes

General Comments

This is a review of the final two volumes of a four-volume research study concerned with the development of driver education objectives and tests through detailed analysis of the driver's tasks.

Volume III describes a set of instructional objectives for driver education courses, as well as an evaluation instrument capable of being used to assess the degree to which the objectives have been attained. The objectives were developed in order to assist driver educators in preparing or revising driver education curricula in a manner that will reflect the needs of the highway transportation system. They do not in any sense constitute a curriculum in themselves. They were developed, it will be well to note, from a systematic analysis of the drivers' task into its component behaviors and an evaluation of the criticality of these behaviors. The task analytic effort is described in

Volume IV describes the development of driver education objectives, the background of the study, and the methods used in preparing a set of performance objectives, enabling objectives, and an evaluation instrument from the results of a driver task analysis.

VOLUME III: INSTRUCTIONAL OBJECTIVES

The instructional objectives which appear in Part I of this volume are grouped into 74 learning units, each consisting of a statement of purpose, a list of the performance objectives, and a description of enabling knowledge and skill objectives.

o Performance Objectives

Performance objectives describe the behavior that students should be expected to perform or be able to perform, upon completion of a beginning driver education course. They are grouped into categories representing either major steps in fulfilling the stated purpose or groups of substantively similar objectives. The sequence in which the objectives appear on a page follows the order in which they would ordinarily occur, if such an order exists.

Performance objectives are also grouped into five major levels of criticality, as rated by a group of highway safety authorities. A set of provisional standards has been applied to the objectives at each criticality level as follows:

High Criticality	95% to be performed correctly
Moderately High Criticality	85% to be performed correctly
Moderate Criticality	70% to be performed correctly
Moderately Low Criticality	70% to be performed correctly
Low Criticality	50% to be performed correctly

These standards represent the judgment of a panel of driver educators as to what should be expected of a student graduating from a driver education course. They should be viewed as goals rather than as firm standards until the feasibility of attaining them has been established.

No standards relating to levels of performance could be established owing to the great range of

A number of performance objectives relate to long-term driver behavior (such as use of alcohol and drugs, care of the automobile, and so forth). Since there is no way to evaluate the student's performance relative to these objectives upon completion of instruction, the objectives are worded in terms of what the "driver" rather than what the student must do, and the statement of purpose is given as that of "educating" rather than enabling the student to perform.

The order in which the objectives are listed in Part I is logical from a teaching viewpoint, following a sequence of generally increasing complexity. However, driver educators have their own preferred ways of approaching their subject and it is not intended that the objectives necessarily be taken up in the order in which they are listed. The sequence employed was simply one of convenience.

o Enabling Objectives

Within each learning unit, the performance objectives are followed by a description of related knowledge and skill objectives. The knowledge objectives consist primarily of facts that are concerned with such things as how, when, where, or why the various performances are carried out, as well as what things look like and where they are located.

Knowledge objectives describe areas of information to be covered by driver education instructors and provide specific facts intended to amplify the more general definition of the objective. It is not intended that the factual information be confined to that which appears beneath the knowledge objective. Each instructor should feel free to include whatever information he feels will enhance an attainment of performance objectives.

Knowledge objectives cut across all levels of criticality. Where specific facts relate to individual performance objectives they would, of course, carry the same criticality as the performances. However, it is the performance objectives themselves to which the standards (percentage correct) apply.

Some performance objectives require more than

objectives include a description of required skills intended to (a) identify performances for which practice must be provided, and (b) identify what appear to be the relevant situational and response characteristics.

EVALUATION INSTRUMENTS

The evaluation instruments appear in Part II and consist of three separate tests – a Driving Fundamentals Test, a Driving Situations Test, and a Driving Knowledge Test.

- Driving Fundamentals Test

  The Fundamentals Test is a performance test designed to assess the student's basic ability to control the motion of an automobile. It is performed on an off-road area or a little-used roadway. No special facilities or equipment are required. It is highly similar in content to off-road tests administered as part of many current driver education courses. The major innovation is a set of performance standards that may be used either in an absolute sense to determine whether a student is "qualified," or in a relative sense to weight the various performances in terms of their rated criticality. Separate tests are provided for manual and automatic shift vehicles.

- Driving Situations Test

  The Driving Situations Test is intended to assess the ability of the student to deal with a broad range of situations that occur in "realworld" driving and is conducted on the road, in ordinary traffic. Since the specific route to be employed must be determined by the administrator, the test itself cannot prescribe the observations that will occur. What it provides are: (a) A list of planned and unplanned driving situations; (b) A check list of observations to be made in each situation, and a format to allow recording of the student's responses; and (c) A set of performance standards that may be used either to determine whether the student is qualified to enter the highway traffic system or to weight the student's performance in terms of its criticality.

  Because the number and type of situations encountered will differ from student to student, the Situations Test is not standardized. However, if the period of observation is long enough – approximately 30 minutes in sufficient – the number of responses observed will be large enough to obtain a reasonably accurate estimate of a student's ability, and comparisons among students may be made equitably. To standardize the test would require limiting the situations observed to those that can be repeated, which would greatly limit the test's validity as a measure of overall driving ability. The development of the test is based upon the assumption that, in an educational setting, it is more important that the test be comprehensive and able to reveal specific student weaknesses than that it provide an equitable evaluation.

  Because of the rate at which observable situations arise, it is important to plan in advance both the route and the specific observations to be made.

  It is suggested that, in large driver education programs with sufficient resources, instructors use the Situations Test not as a test itself but as an aid to preparing route-specific tests of their own that would identify particular situations for observation and would list them according to the sequence in which they would be encountered.

- Driving Knowledge Test

  A 105-item Knowledge Test has been furnished as a means of assessing the student's mastery of certain enabling knowledges. While most of the items are multiple choice, eight completion items were prepared to cover information for which the multiple-choice format is not appropriate. Scoring standards for Knowledge Test items, based upon those applied to the performance standards to which the information relates, are included.

VOLUME IV: THE DEVELOPMENT OF INSTRUCTIONAL OBJECTIVES

The last and final volume of the reports describes the methodology employed in the development of the instructional objectives and evaluation instruments which resulted from the task analysis.

- Development of Performance Objectives

  The task analysis produced a list of over 1700 specific driving behaviors grouped into 45 tasks. A panel of highway safety authorities selected behaviors that were critical enough to be considered essential requirements for all new drivers. These behaviors were designated as performance objectives. Objectives having common or similar purposes were grouped into individual "learning units." The performance objectives within each learning unit were divided into five categories of criticality on the basis of criticality indices developed during the first phase of the study. The objectives were printed using a matrix format in

which individual objectives were listed down the page according to their sequential or logical order, and across the page in terms of their criticality. A set of performance standards, specifying the minimum number of objectives to be performed correctly at each level of criticality, was developed by means of a rating process carried out by 48 driver educators. (Refer to the earlier section of the synopsis under Volume III for the criticality levels.) Standards relating to quantitative levels of performance (i.e., measurable as to degree or amount), were found to be not appropriate, and, therefore, standards were treated as qualitative, "pass-fail."

- Development of Enabling Objectives

For each learning unit, the knowledges and skills that enable the performance objectives to be met were identified. Knowledge objectives consisted of the procedural, factual, and conceptual information that allowed students to carry out the prescribed performances. The knowledge objectives dealt with factual information primarily because procedural knowledge is redundant with description of the performance itself, and driving is not dependent upon conceptual information. One category of factual information played a purely enabling role by identifying such things as when, where, or to what degree an activity was performed, where things were located, what they looked like. The other category consisted of facts related to the reason an activity is performed and was intended primarily to influence attitudes toward performance of tasks. Skill objectives involved those perceptual and motor processes that are required, over and above possession of information, and which must be developed through practice in order that performance objectives be met. Specification of skill objectives dealt largely with descriptions of relevant cues and responses and has provided less to explain the nature of skills than to identify those performance objectives that could be met and evaluated only through actual performance.

- Development of the Evaluation Instruments

Three types of tests were developed – a Driving Fundamentals Test, a Driving Situations Test, and a Knowledge Test. The Fundamentals Test described a series of standardized, off-road maneuvers designed to assess the student's ability to control the speed and direction of the automobile. The Situations Test was essentially a checklist intended to assist an administrator in observing and recording the student's responses to such driving situations as occur in an essentially normal trip. All tests were scored in terms of percentage of items performed correctly in order that individual results could be compared with established performance standards. The evaluation instrument was administered to students at a neighboring high school to assess feasibility of administration. No reliability, validity, or normative statistics were compiled. However, because it was derived from an analysis of tasks, the measure is considered to have content validity; traditional concepts of psychometric reliability are considered not to apply.

RECOMMENDATION FOR ADDITIONAL TEST DEVELOPMENT

The Driving Knowledge Test and Driving Fundamentals Test were found to be relatively easy to administer and capable of providing meaningful results, as is the case for tests similar to them in method and content that are currently in use. In the Driving Situations Test, the rate at which situations occur in normal driving made it extremely difficult for the administrator to record even a majority of the student's responses. This was true even when the administrator was thoroughly familiar with the contents of the test and had planned his route well. A sequential listing of the situations as they will arise along a particular route is needed. Some combination of written and graphic format would be the most effective in attaining the fullest possible use of driving situations.

An illustration of the format is given in the report. It suggests that the format, which is a schematic drawing or a map of several well traveled city blocks might be adapted to a particular locale. Although it covers only the beginning portion of the test, it illustrates a number of points. First, all planned situations are listed in an order in which they are known or will arise, making it unnecessary for the instructor to decide which observations to make and allowing him to record his observations readily. To avoid overloading the administrator, it is suggested that the situations to be scored should be spaced out (on the schematic) and only those responses that are most critical or most likely to be required are specified.

Unplanned situations may be entered into the sequence of planned observations at points where they are most likely to occur and where the administrator is free to attend to them. The example given is: parked cars and their passengers are observed in a particularly busy shopping area. A lane change is observed where a lane change is going to be necessary.

Observations of continuous behaviors, that is, speed control and a car following, must still be made at specific times. However, rather than being tied to a general class of events, such as speed signs and cars slowing down, observations can be made at points along the road where they are most relevant.

Results obtained from a route-specific test (shown in Figure 7 in the report) should have a great deal more objectivity than those obtained from administration of the more free-form driving situations test. First, the format forces the administrator to plan his route and observations in advance. Second, it identifies a specific observation to be made in planned situations and greatly circumscribes those observations to be made in unplanned situations. While a certain number of prospective observations have been eliminated in both planned and unplanned situations, the sacrifice will be relatively small if the observations are selected with due consideration to criticality and the likelihood that particular situations will arise at particular points.

A test such as the one suggested can be prepared only by an individual driver education instructor for his own local area. In preparing a local test the instructor could utilize the Driving Situations Test as a guide to the types of observations that can be made in various situations. However, if he is to prepare a truly effective test, the instructor needs a great deal more guidance than is furnished in the test itself. Such guidance would include (a) procedures for selecting highly efficient routes, that is, routes with a large number and range of situations per unit of administration time, (b) guidance on the selection of multiple routes for testing more than one student in a single trip, (c) ways of involving the non-driving student that will improve their learning and enable them to provide assistance to the instructor, and (d) methods of providing feedback to student drivers on the nature of their errors. Preparation of such guidance fell outside the scope and resources of the present study; however, it should be pursued.

The results obtained in pilot administration of the Driving Situations Test provide evidence that students can be effectively evaluated through their responses to real-world driving situations. Furthermore, until the facilities and the devices available to driver educators are greatly improved, the highway will remain the only setting in which many highly critical performances, knowledges and skills can be evaluated. It is recommended, therefore, that the National Highway Traffic Safety Administration foster the continued develop-

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The Contract Manager has certified that the contractor's study has been satisfactorily completed and that all contractual obligations in this project have been met.

The opinions, findings, and conclusions expressed in this synopsis are those of the contractor and not necessarily those of the National Highway Traffic Safety Administration.

Availability: NTIS. For the previously announced Volume I and Volume II, order DOT/HS-800 367 (PB-197 325) and DOT/HS-800 368 (PB-197 688).

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